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A SINGLE BALANCED SKIP FOR LOWERING IN INCLINED WORKINGS

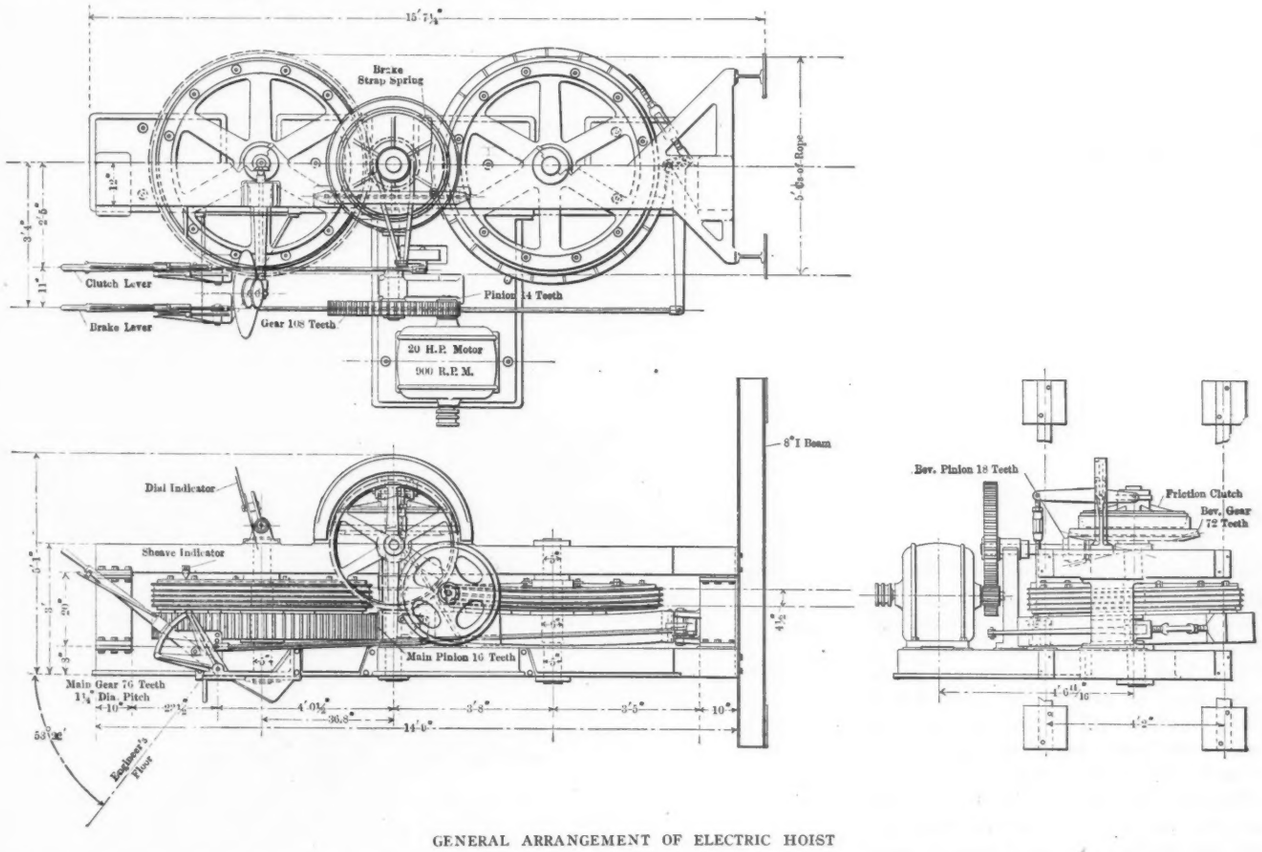
A New Installation at the Liberty Bell Mine—Advantages and Economy

BY S. A. WORCESTER*

The Liberty Bell mine, Telluride, Colorado, has a fissure vein of very uniform thickness, with a pitch of about 53 deg. from the vertical. The vein has been worked several thousand feet horizontally on the present main working level, and about 800 to 900 ft. on its pitch above this level. The vein matter is a mixture of talcy, sticky mud and hard quartz. Water in considerable quantities is present in nearly all parts of the mine, and in the chutes it mixes with the talc, seals all openings and accumulates such hydrostatic pressure as to burst the longer chutes very frequently.

This annoyance, added to that of the jams caused by large rocks and the great wear on the chutes, involved such expensive delays and repairs that the general superintendent, Charles A. Chase, finally abandoned the principal chute, about 800 ft. in length, and installed in its place a bottom-dumping skip, with an overbalance weight for returning the empty skip. The weight, which runs on a very narrow track, balances the skip plus half of the ore-load. The skip now lowers a large portion of the mines' output with good economy and satisfaction. A new tunnel, 2600 ft. in length, has been cut at a vertical distance of 800 ft. below the present main working level of the mine. When the vein was cut it was developed perhaps 100 ft. or more in either direction, and was found to have the same pitch and general characteristics as in the upper workings. This tunnel is to become, when the necessary preliminary work and new installations are completed, the main working outlet of the mine.

The installation which was at first contemplated for lowering ore from the present working level to the new or Stillwell tunnel consisted of balanced cages, for lowering mine cars in a vertical shaft. In this case an electric motor of 40 to 50 h.p., would be necessary for hoisting an unbalanced cage, when changing levels. Later counsels, however, brought to prominence the cost of a vertical raise in the country rock with the necessary cross-cuts to the vein, also the increasing length and expense of these cross-cuts when mining is carried, as it eventually must be, below the Stillwell level. Comparison of this arrangement with a raise on the vein, in which all mining would be profitable, and the cross-cuts, with their attendant extra length of tramming, and their objectionable change of direction from tramming on the course of the vein, led to more



GENERAL ARRANGEMENT OF ELECTRIC HOIST

*Mining engineer, Victor, Colo.

careful consideration of the latter proposition. The writer was called in consultation, and after a number of preliminary layouts had been made in various forms, and had been carefully compared, the plant here illustrated was designed.

THE PLAN ADOPTED

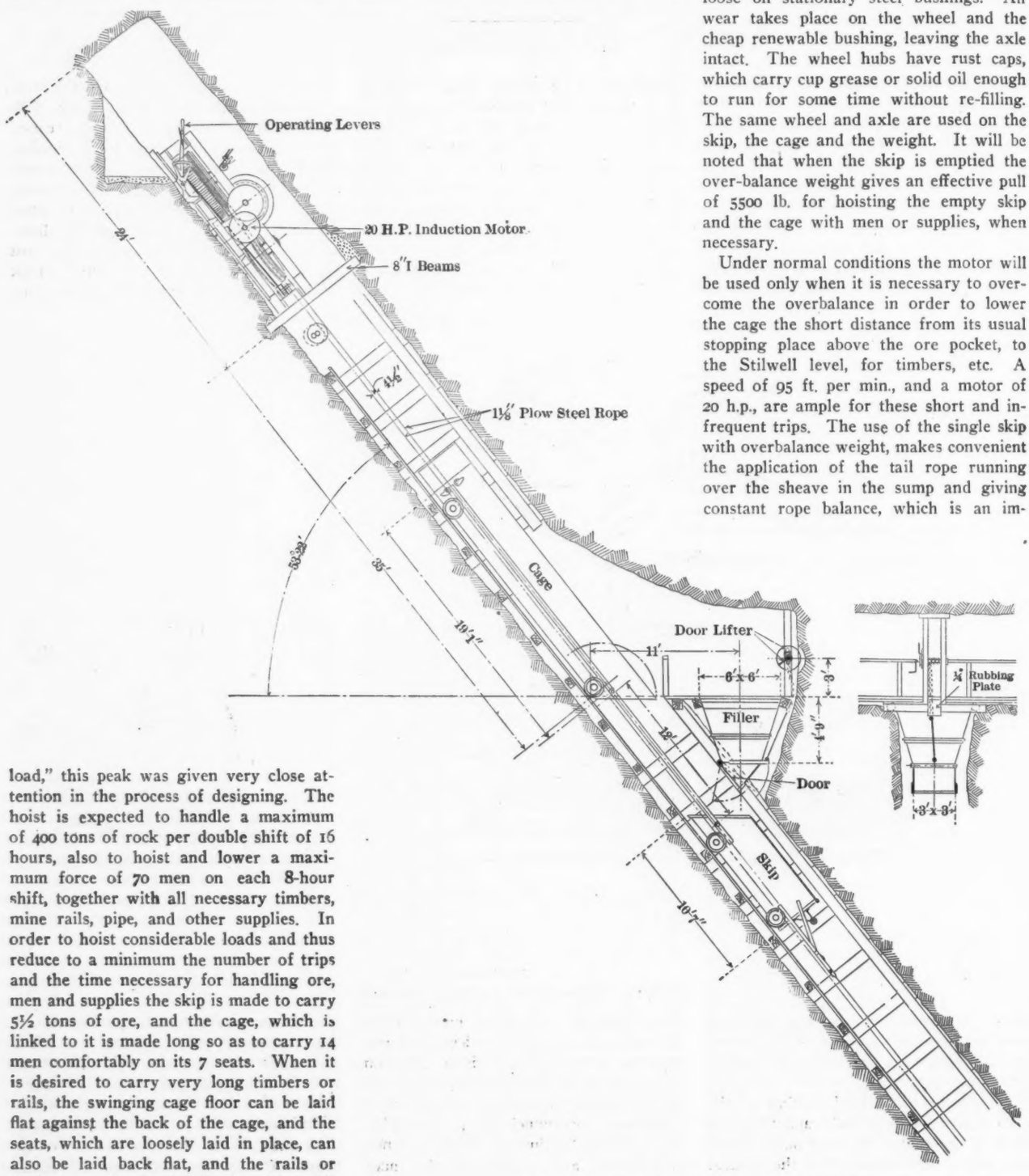
The skip is made relatively long in order to gain large capacity without involving large cross section. As a motor is necessary and current is purchased at a monthly rate governed by the "peak of load," this peak was given very close attention in the process of designing. The hoist is expected to handle a maximum of 400 tons of rock per double shift of 16 hours, also to hoist and lower a maximum force of 70 men on each 8-hour shift, together with all necessary timbers, mine rails, pipe, and other supplies. In order to hoist considerable loads and thus reduce to a minimum the number of trips and the time necessary for handling ore, men and supplies the skip is made to carry 5½ tons of ore, and the cage, which is linked to it is made long so as to carry 14 men comfortably on its 7 seats. When it is desired to carry very long timbers or rails, the swinging cage floor can be laid flat against the back of the cage, and the seats, which are loosely laid in place, can also be laid back flat, and the rails or timbers can be loaded in the skip with their upper ends in the cage.

The hoisting rope has an ample safety factor for lowering a full cage load of men and a skip-load of ore at the same time, so that very little time will be lost in hoisting and lowering men and supplies. The intention is to lower a skip-load of rock, as a rule, at every downward trip.

OVERBALANCE MECHANISM

The overbalance weight, a device which has now been in use a little over two years, in connection with a skip-hoisting plant which I designed for the Camp Bird, Ltd., Ouray, Colorado, is used with this 5½-ton skip and cage. Its 14,500 lb. balance the skip and cage, with all attached parts, plus one-half of the average ore-load. The weight is in the form of two built-up I-beams, forming with the bed-pieces a box, without top or bottom. Between the beams, and resting on their inner flanges, are placed flat cast-iron weights of about 130 lb. each. Steel bracket axles carry 16-in. wheels, which run loose on stationary steel bushings. All wear takes place on the wheel and the cheap renewable bushing, leaving the axle intact. The wheel hubs have rust caps, which carry cup grease or solid oil enough to run for some time without re-filling. The same wheel and axle are used on the skip, the cage and the weight. It will be noted that when the skip is emptied the over-balance weight gives an effective pull of 5500 lb. for hoisting the empty skip and the cage with men or supplies, when necessary.

Under normal conditions the motor will be used only when it is necessary to overcome the overbalance in order to lower the cage the short distance from its usual stopping place above the ore pocket, to the Stilwell level, for timbers, etc. A speed of 95 ft. per min., and a motor of 20 h.p., are ample for these short and infrequent trips. The use of the single skip with overbalance weight, makes convenient the application of the tail rope running over the sheave in the sump and giving constant rope balance, which is an im-



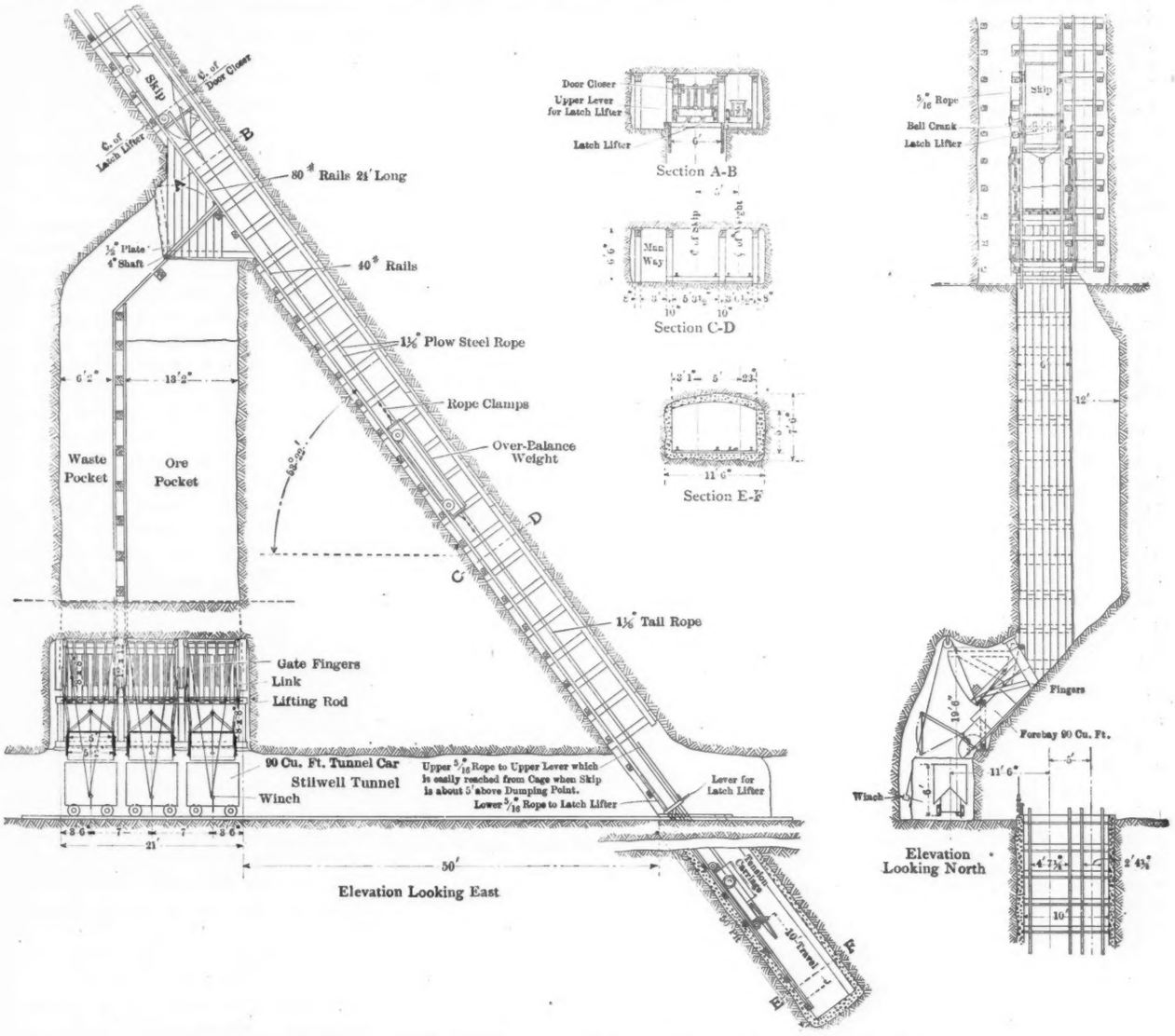
EAST AND NORTH ELEVATIONS OF SKIP FILLER

portant item in its influence on the "peak of load."

LOADING AND DUMPING

The skip is loaded by means of a "filler," a steel pocket holding four mine carloads of ore or one skip-load. The cars will be hauled to the station in trains of 12 to 16, and the skip tender will spend most of his time dumping cars into the "filler," while the skip is making its trips of 1100 ft., dumping, closing its door and returning. On the arrival of the skip he simply releases a pawl and the filler door drops, and the skip is quickly filled at a single operation, without danger of overfilling. The skip door of ½-in. plate, well reinforced with bars, is held by two spring latches, either of which will hold it safely if the other should be accidentally loosened. The door is so designed as to clear the shaft timbers, whether open or closed. The door latches are lifted by striking cams on the latch lifter. If it is desired to pass the dumping point without opening the door, as for instance in hoisting or lowering rails in the skip, the latch-lifter can be thrown out of line with the latches by using the lever shown at the Stilwell level, or a similar lever which is easily reached from the cage when at a short distance above the ore bin.

The door is closed, when the skip ascends, by two cams, one on each side of the raise, a short distance above the dumping point. The cams encounter rollers on the door as the skip passes. These cams are strong leaf springs, and, if by accident (as for instance scraps of old mine timber catching in the skip) the door should be prevented from closing, these springs will yield and prevent damage to any of the parts. A simple indicator or tell-tale will be placed at the upper level, and will be operated by the roller on the skip door, so as to warn the skip tender if the door should fail to close.



METHOD OF DISCHARGING FROM THE SKIP INTO THE ORE POCKET AND INTO THE CARS

ARRANGEMENT OF THE HOIST

The position and arrangement of the hoist are rather unusual, and have the merit of requiring very small excavation and no deflecting sheaves for the hoisting rope which leads directly from the hoist sheaves to the cage and overbalance weight. The hoisting mechanism resembles the usual form of cable railway rope-drive or gravity-tramway headgear. It is much more compact than a double drum hoist, and keeps the rope always in line with the vertical centerline of the shaft compartment, a condition which favors a long life for the rope. The dial indicator makes nearly one revolution, while the skip makes its trip. The sheave indicator is placed very near the dial indicator, and almost in the same line of vision for the engineer.

The strap brake is made in halves for convenient removal, and its differential leverage is unusually powerful. The hoisting-sheave rim is bolted to the main-gear rim, and the braking-sheave rim is bolted directly to the brake-wheel rim, with large bolts, thus avoiding torsion on the shafts, and transverse strains on the wheel arms. The friction clutch is of very simple construction, with wooden male cone and iron female surfaces, and is ad-

justed by means of a single sleeve nut. It is so placed in the transmission that only the main gears turn when the motor is not in action. The cast-iron frame, of box section, is simple and substantial.

At the lower terminal of the raise the ore is dumped, when the skip door is opened, directly into the ore bin. When waste is dumped, the door, sheathed with heavy plate and hinged on a 4-in. shaft, is laid down and deflects waste rock into its proper bin. At the bottom of the ore and waste bins are chutes or "forebays." The finger gates, of 12x12-in. and 8x8-in. timbers, are a peculiar feature. Five fingers are raised at once by using the winch, and when ore enough has passed to fill the forebay the fingers are lowered. Each finger has a weight of 100 lb. or more on its arm, and when the arm is lowered the finger prevents any more ore from passing. This form of gate has been used for some time at the present ore house at the mine with good satisfaction. It replaces the former sliding-bin gate, which gave constant trouble by the jamming of large rocks. The forebay has a capacity slightly less than that of the tunnel car, 90 cu.ft., and by lowering the apron gate the car is quickly filled without danger of running over.

ECONOMY OF PLANT AND ADVANTAGES

By designing this plant before constructing the raise and adopting the arrangements described, a saving of several thousand dollars was made in original cost of raise and equipment, as compared with any other form of plant proposed. The monthly saving in cost of current over the 40-h.p. motor, which was the smallest proposed with any other arrangement, is about $120, and it is believed that the saving in labor will be several times this amount.

The single skip as here arranged and as compared with two balanced skips has, among other advantages, the following: It is always ready to move on signal without waiting for an opposite skip, and on this account has much more than half the capacity of two balanced skips of equal size. Assuming that a single overbalanced skip may be given twice the length of the ordinary type of skip, it will then have more than the capacity of two ordinary balanced skips because no time is lost by one side waiting for the other. It is free from accident because the engineer has but one hoisting compartment to watch. It is well known that fully 75 per cent. of the accidents with two-compartment hoists result from the difficulty of keeping both sides constantly in mind. In order to use the sheave hoist and tail rope with balanced skips, it would be necessary to have very cumbersome and expensive arrangements for lengthening and shortening ropes for working from different levels, but with the overweighted arrangement no such apparatus is required.

PROPOSED CHANGES IN SURFACE PLANT

The tunnel cars, before noted, will be hauled in trains by an electric locomotive to the ore bins, or to the waste dump at the mouth of the tunnel. The angle station of the present aërial tramway is just below the mouth of the Stilwell tunnel, and will be made the upper terminal of the tramway when the new plant is installed, and the upper portion of the tramway will then be abandoned. The crusher plant, which was formerly at the upper terminal of the tramway, just below the present mine portal, and was carried away by a snow-slide, will be erected near the ore bins of about 6000 tons capacity which are to be placed at the new tramway terminal at the mouth of the Stilwell tunnel. The present speed governor, an automatic arrangement for regulating the speed of the tramway buckets, will be moved down to the new terminal.

The ore-handling plant, which I have described, was designed by the writer, in collaboration with C. A. Chase, to whom acknowledgment is due for a number of its original features. Since these designs were completed two other companies in this State decided to substitute skip plants for long chutes for lowering ore to tunnels.

Deposit of Lead Carbonate at Viola Mine, Idaho

BY ROBERT N. BELL*

The Viola mine, Lemhi county, Idaho, had a great body of almost clear sand carbonate of lead 1200 ft. long, descending on a flat dip in blue limestone near a pronounced quartzite contact 200 ft., where it was cut off by a vertical fault. Back of this fault on an adjoining property a body of soft brown carbonate of iron exists that has been developed to the extent of a block 200 ft. square without reaching any limit. It is sprinkled with a little lead carbonate, has a light value in silver and gold and presents a remarkably attractive prospect to follow down.

Ten miles farther southeast on the same pronounced lime quartzite contact is a body of soft, spongy, brown gossan ore, 10 to 60 ft. wide and 2000 ft. long. At its highest crest, crossing a steep mountain ridge, it carries a streak of rich carbonate of lead on the hanging wall, a foot wide, containing 50 per cent. lead, 20 oz. silver and $5 gold, together with a 5-ft. streak of 10 per cent. concentrating ore. All the great gossan showing on this vein contains light values in silver and gold, together with a trace of copper, and it is eminently probable that the lead showing referred to in this connection will expand to important proportions with further development.

*State Inspector of mines, Boisé, Idaho.

The Spelter Market in 1906

The spelter market during 1906 displayed a comparative degree of steadiness. Fluctuations were far less wide than in former years, although they occurred at frequent intervals. This would seem due to the tendency of smelters to sell only their current output, so that during periods of a heavy demand prices were driven up quickly, while upon the subsidence of business a decline was brought about through efforts to market the spelter as produced. The movements in either direction were, however, held in check, at times by the proximity of the European market and throughout by the fact that the domestic consumption about equaled production.

Except for the high-grade special brands produced in the East, for which there is a regular outlet in Europe, there were no exports. The increased consumption in this country was taken care of through the operation to the full capacity of all existing works during most of the year. Several of the old Kansas coal smelters were remodeled and are now being operated. At the present time there are in course of erection two smelters at different points in the Illinois coalfields and two more in the gas belt of Kansas and Indian Territory, which will contribute to the output during 1907. The active utilization of complex zinc ores in the West and a more comprehensive development of the calamine mines in the northern part of Mexico have supplied the increased requirements of raw material. As a result, the margin between the price of ore and the price of spelter has been wider than a few years ago, when its closeness worked to the great detriment of the smelting industry.

The prices at the beginning of January stood at 6⅜c. St. Louis and 6.50c. New York. A surplus had been carried over from the previous year, and in an effort to market it prices were depressed, at first gradually, and then quickly, until they reached 5.90c. St. Louis, 6.05c. New York, at about which level the market remained during the whole of February. The lower level brought about a buying movement in March of very large proportions, which lifted the market to 6.20c. St. Louis, 6.35c. New York, by the middle of the month. The discussion of the possibility of a coal strike caused buyers to hold off about that time, and as a consequence the market again receded gradually until it drifted to 6c. St. Louis and 6.15c. New York toward the end of March. In April the decline made further progress, there being a desire on the part of smelters to put out some spelter against their supplies of ore, which came in freely from the West at the opening of the season. The same causes affected the market during May, until 5.80c. St. Louis and 5.95c. New York were touched about the last of that month.

A new factor made its appearance in June through a rather brisk advance in the London price to about the parity of the domestic market. This resulted in a very heavy inquiry for export. There being no surplus stocks, business for export did not result; but the aforesaid conditions stimulated buying for both speculative and consumers' account in this country, so that in the month of June prices recorded an advance to about 6.10c. St. Louis, 6.25c. New York.

With a decline in the London market, prices here again drifted back almost to the starting point, and business during July was done between 5.80 to 5.90c. St. Louis and 6 to 6.05c. New York. During the entire month of August the market remained steady at around this level, with a good business doing from day to day. The great industrial activity, which had previously had a pronounced effect on all other metals, finally made itself felt in the spelter market in September, and under a very heavy demand from all interests prices moved up to 6.15c. St. Louis, 6.30c. New York, at which figures they stood at the close of the month.

A slight reaction took place in October, but buyers only waited for some recessions to renew their purchases on a large scale, and by the beginning of November the market had again made up the decline. A steady and sustained demand resulted not only in the maintenance of prices, but brought about a further slight advance during November, which closed firm at 6.25@6.30c. St. Louis, 6.40@6.45c. New York. At the beginning of December it became apparent that all available supplies had been absorbed by the unprecedented consumption on the part of both galvanizers and brass manufacturers. In consequence of this consumers deemed it advisable to cover their requirements for the early part of the coming year, even though they were compelled to do so at advancing figures. The year closed with the market steady at 6.60c. St. Louis, 6.75c. New York.

Operations at White Knob Mine

BY ROBERT N. BELL*

The White Knob mine, at Mackay, in Custer county, Idaho, has been successfully handled during the past year by a Western company, which holds a lease of the property, and which has mined and smelted 50,000 tons of ore, containing more than 4 per cent. copper.

The ore is principally oxide and carbonate of copper, and is mined from big surface quarries near the croppings of the deposit, for the treatment of which the big smelter, with which the property is equipped, was designed by the first manager of the White Knob, Wayne Darlington. Subsequent managers, however, changed his plan, and made a matting plant of it by which method the ore is now treated, using iron sulphides shipped in from Bingham, Utah, to furnish the necessary sulphur, as the White Knob mine, although developed to a depth of 700 ft., never showed an important increase of sulphide ore.

The ore occurs in lenses and irregular masses in the quarries associated with garnet rock, a soft, gray porphyry, near a contact of pure blue limestone and eruptive granite. It is doubtful whether the underground development of the property has ever found the true vent of the mineral, and the extensive working of the great surface showing on the property may lead to important deposits at depth in a different position on the contact than it has been sought for.

The present leasers are handling the proposition in a conservative and practical manner. They have replaced the old company's electric hauling system with a Shay geared locomotive, which hauls the ore from the mountain to the smelter over a 6 per cent. grade 6 miles long, at a greatly reduced cost.

The operation would have been very profitable during 1906, but for a disastrous fire in the summer which destroyed the ore-house and machine shops at the smelter, and caused a loss of nearly $100,000, and interrupted the smelting operations for more than a month.

The smelter has two stacks with a capacity of 600 tons per day, but the ore resources have justified the operation of only one thus far.

The necessity of purchasing sulphide ore to make matte greatly increases the cost of treatment. This could be largely reduced by reconstructing the furnaces to make blister copper direct as the ore is especially adapted for that method of treatment.

*State inspector of mines, Boisé, Idaho.

The Sicilian Sulphur Situation

Emil Fog & Sons, of Messina, Sicily, write that prices of sulphur have recently advanced 5s. on all quotations, and it is announced that a further increase will be made soon. This advance in prices, together with the fact that the banks are advancing four-fifths of its value upon any quantity of brimstone that is produced, has produced a revival of the sulphur industry in all its branches.

Recently a shipment of 1500 tons of sulphur was made to New York. This shipment is contrary to what had been the previous practice of the *Consorzio,* and it is interesting to know why the custom of this company has been changed.

It is reported that an offer has been made by an American company to purchase 150,000 tons of sulphur per year. The company which offers to take this sulphur proposes to abandon pyrite burning in favor of sulphur in the process of making sulphuric acid. The price offered on this shipment was 14s. f.o.b. Sicilian ports. The offer is under consideration by the *Consorzio,* but it is generally thought that the price bid is too low. However, in order to dispose of the large stock of sulphur on hand, the *Consorzio* appears willing to grant material reduction in prices to acid factories which will engage to abandon pyrite burning, and go over to brimstone instead.

For the Prevention of Mining Frauds

The gist of the proposed law for the prevention of fraud in the promotion of mining enterprise advocated by the American Mining Congress, is found in the following section:

"Any person who knowingly makes or publishes in any way whatever, or permits to be so made or published, any book, prospectus, notice, report, statement, exhibit or other publication of or concerning the affairs, financial condition or property of any corporation, joint-stock association, co-partnership or individual, which said book, prospectus, notice, report, statement, exhibit, or other publication, shall contain any statement which is false or wilfully eagxgerated, or which is intended to give, or which shall have a tendency to give, a less or greater apparent value to the shares, bonds or property of said corporation, joint-stock association, co-partnership or individual, or any part of said shares, bonds or property, than said shares, bonds or property, or any part thereof, shall really and in fact possess, shall be deemed guilty of a felony, and upon conviction thereof shall be imprisoned for not more than 10 years or fined not more than $10,000, or shall suffer both said fine and imprisonment."

Erratum

In the article by James Darroch and C. A. Meiklejohn on "A Rapid Method of Determining Molybdenum," in our issue of November 3, the calculation which read: "Standard × number of c.c. lead acetate solution required ÷ weight of ore taken × 100 = per cent. of molybdenum in ore," should have been printed as follows: "Standard × number of c.c. $Pb(C_2H_3O_2)_2$ solution required ÷ weight of ore taken, × 100 = per cent. of molybdenum in ore."

Platinum

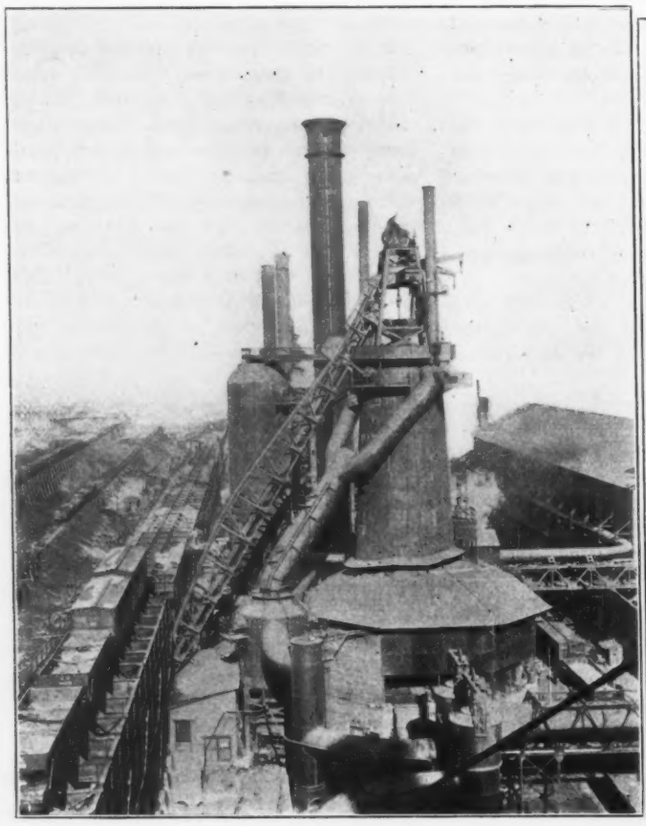
During the first six months of 1906 the exports of platinum from Russia amounted to 156 poods, as compared to 48 poods for a similar period during 1905, and 82 poods for 1904. The price has advanced from 3000 roubles, in 1880, to 34,000 roubles in October, 1906. The advance in value during the first ten months of 1906 was 12,000 roubles per pood.

THE BLAST FURNACES AT THE MINNEQUA STEEL WORKS

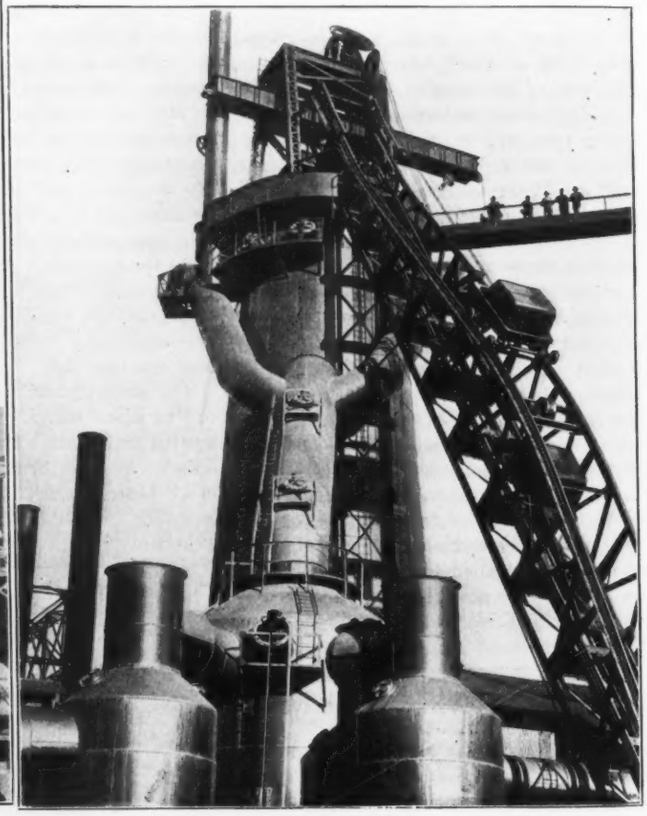
The Five Stacks of the Colorado Fuel and Iron Company at Pueblo—Equipment and Method of Operation—Details of Construction

BY LAWRENCE LEWIS*

The first blast furnace of the Colorado Fuel and Iron Company, at Pueblo, the present furnace C, was blown in during September, 1881; the second, since torn down, in November, 1889; the third, the present furnace B, in November, 1892. The two furnaces of the old plant still in use have been entirely rebuilt since 1900. Despite their small size, 75 ft. high and 17 ft. in diameter, and the disadvantage of being equipped with elevators instead of skip hoists, they are still doing satisfactory work and each produces approximately 200 tons of pig iron per 24 hours. The three new blast furnaces were first blown in as follows: A, September, 1901; D, November, 1902; E, May, 1903. The new furnaces—A, D and E—are each 20 ft. in diameter and in hight are respectively 95 ft., 95 ft. and 90 ft. Each has an average capacity of 400 tons every 24 hours. During the past year four out of the five furnaces have been in constant operation and the fifth will soon be put again into commission after relining. In order to have one furnace at all times available, in case of accident or stoppage of any one of them, contracts have been made for the completion of a sixth furnace (furnace F, 20 ft. in diameter by 85 ft. high, designed for a capacity of 400 tons). Each of the large new furnaces, with its bins, blowing engines, etc., costs approximately $1,000,000.



BLAST FURNACE "D"



AUTOMATIC CHARGING APPARATUS

*The writer of this article is indebted to J. B. McKennan, manager of the Minnequa works, to H. A. Deuel, chief engineer, Minnequa works, and to other officials who kindly furnished material and assisted in other ways in its preparation.

FURNACE EQUIPMENT

The Rust automatc hoist, an automatic charging apparatus which possesses several new features, is used for conveying stock to the top of the furnaces. The skip cars pass one over the other near the center of the bridge truss, discharging their contents at the top in such a way as to give a proper distribution of the lumps and fine material throughout the stock hopper at the top, so that the large lumps of ore, instead of being deposited on one side of the hopper, opposite the bridge, are practically uniformly distributed around the stock hopper near the center.

The bridge occupies little space laterally and is a very stiff structure for the weight of material used in its construction. The greatest depth is at the center, where the maximum bending moment occurs. Both skip cars come to rest in the pit below at exactly the same point.

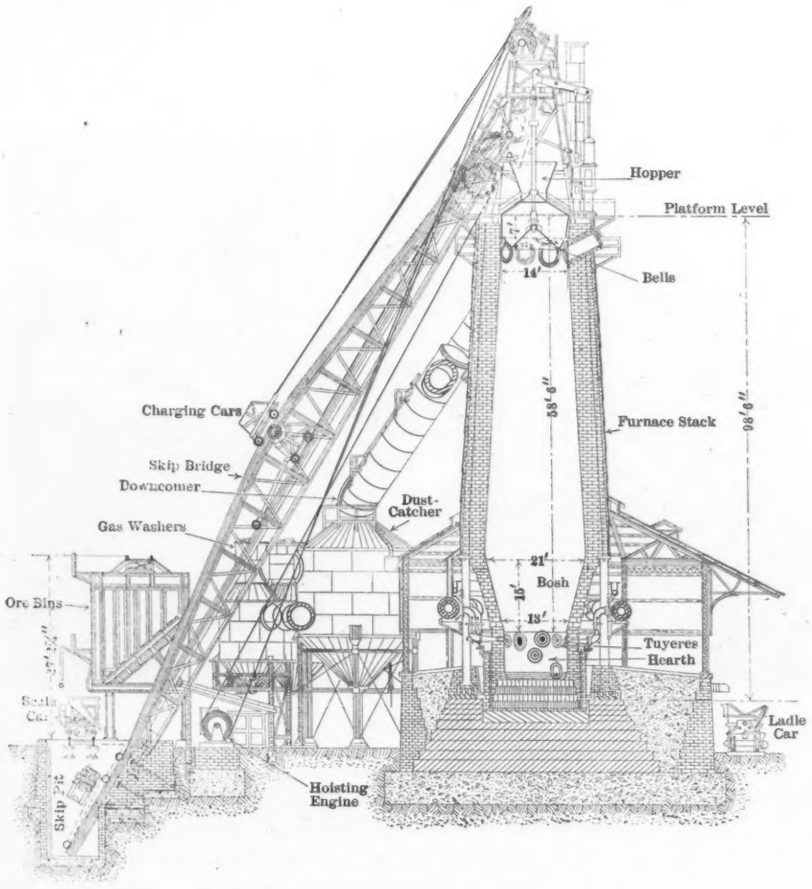
The hoist is of 10 tons capacity, the capacity of the cars being 150 cu.ft. It is operated by means of an electric motor hoist furnished by the Otis Elevator Company. The cars are fitted with guards, so constructed that there is no possibility of their leaving the track when thrown off the rails by obstructions or unforeseen events. Each car is attached to a double cable by means of an equalizing device, so constructed that the tension on the two cables is always equal. The two bells at the top of the furnace are worked independently by steam cylinders, the valves for which are located in the hoist house below, where is also placed a gage showing the relative positions of the bells.

FURNACE STACK

The furnace mantle rests on 10 cast-iron columns, and the bosh is fitted with 10 tuyeres 7 in. in diameter. Bronze cooling plates with heavy steel bands support the bosh. The steel hearth jacket, which thoroughly binds the well of the furnace, is cooled by means of a system of pipes

placed just inside of the jacket in the brick work.

The two downcomer connections meet about midway of the downcomer, forming one central flue, which terminates at the top of a large dust catcher, 24 ft. in diameter. To the dust catcher are connected two vertical gas washers, from one of which the gas main leads to the boilers, while the other opens into the gas main leading to the stoves. The gas washers are so constructed that they can be run either wet or dry. The gas washers and dust catchers are so elevated that an ordinary gondola car can be placed beneath the outlet bell at the bottom and the dust or slush discharged directly into the cars.



VERTICAL SECTION OF BLAST FURNACE

The gas flues to the stoves and boilers are provided with numerous down legs and pockets which serve to catch the dust before reaching the boilers or stoves.

The cast house is covered by a 20-ton electric traveling crane for handling the troughs, scrap, clay, sand, etc. The metal is tapped into ladles and conveyed direct to one or the other of the steel converting departments or to the casting machines. The hot-metal cars are of the ordinary type, without tilting gear. The cinder cars are of the Weimer make, of about 200 cu.ft. capacity.

HOT-BLAST STOVES

There are four stoves for each furnace. They are of the Cowper type, 21 ft. in diameter by 106 ft. high and are supplied with the necessary cleaning and air doors, the gas being admitted to the combustion chamber by means of improved Spearman hot-blast valves. The furnaces are connected up in pairs, having a single draft stack for the stoves of two furnaces, while the boilers are provided with independent stacks. The draft stack is 12 ft. 6 in. in diameter in the clear by 210 ft. high.

BOILERS AND ENGINES

Furnace A is equipped with 3600-h.p. Babcock and Wilcox water-tube boilers. In addition to this there are 14,500-h.p. Cahall vertical boilers installed to furnish steam for furnaces B, C, D, E and F and for the new bessemer department, all of which are arranged to burn furnace gas.

The blowing engines were built by the William Tod Company of Youngstown, Ohio. These engines are of the vertical cross-compound, condensing, quarter-crank, steeple type. The steam cylinders are equipped with Corliss valves, while the air cylinders are provided with positive-acting inlet and discharge valves. The engines for furnace A have open frames, while those for the other furnaces are of the "tree trunk" or bell-frame type. The steam cylinders are 44 and 90 in. in diameter, 60 in. stroke; the two air cylinders are 90 in. in diameter, 60 in. stroke. The total weight of a single engine is about 1,000,000 lb. Each pair of furnaces is provided with five engines, one of which is a spare. It is noteworthy, in passing, that the low-pressure cylinders, for steam and air, measure 90 in., or 7½ ft. inside diameter, and are quite large enough for a boy on a pony to ride through with plenty of room overhead.

For the benefit of those who are not thoroughly conversant with blast-furnace practice, the following non-technical remarks about the construction and operation of the new furnaces at the Minnequa works may be of interest.

FOUNDATIONS

Excavations for blast-furnace foundations at Pueblo were carried to a depth of about 15 ft., practically to bed rock. The foundation is built of stone, concrete and brick, a cement mortar being used throughout, so that, when finally hardened the whole has the homogeneity of solid rock.

The retaining walls, which support the cast house and the runways for the molten iron and slag, are built up about 15 ft. above the general yard level, and the interior is filled with sand. Sand is used for the reason that it is readily shaped for runways. Also, any iron which may form along the sides can easily be removed, which is necessary after each "cast," that is, every time the hot metal is withdrawn from the furnace.

THE BLAST FURNACE PROPER

The furnace proper may be divided into four parts: the hearth or crucible; the bosh; the stack; and the top or head frame and bells.

The hearth, which is directly above the foundations, is about 8 ft. high and 13 ft. in diameter, and is built of 4½ ft. of firebrick inside a hearth jacket 21 ft. in diameter. This is where all the molten iron is collected, and the refuse slag is drawn off. The construction is so arranged that the outer surface of the hearth is constantly cooled by running water. At the same time every precaution is taken that there may be no possibility of the iron and water getting together.

The bottom of the hearth consists of tile made of the best fire-clay, and in a special form. The bottom is several feet in thickness, and extends a foot or so up into the hearth jacket. The hearth jacket, which is constructed of steel plate about 1½ in. thick, completely surrounds the hearth. This jacket has a number of holes to admit of tapping the slag and iron. The holes are called notches; the lower one is called the "iron notch," and the upper one the "cinder notch." The iron notch is at the bottom and is arranged to draw off all the molten iron in the furnace. The cinder notch is 3 to 4 ft. higher and taps the slag.

The hearth has a concentric area outside of the jacket that is always filled with

running water. On the inside of the jacket, pipes extend down 7 ft. in the brick work, and are capped at the ends. These pipes are connected with others of smaller diameter—open at the ends and nearly the same length—acting as feed pipes. The water, entering through the small pipes, passes up through the large pipe and overflows into the concentric space described. This in turn flows over a dam, and thence to the sump. This arrangement keeps the hearth from burning out, which it would otherwise do in a short time.

THE BOSH

The "bosh" is that portion of the furnace body which extends from the hearth up to a hight of about 21 ft., or as far as the mantle, a heavy annular frame which rests on top of the columns, and is attached to and supports the shell of the stack. Consequently the bosh and stack are independent of each other.

The bosh is built of the best quality of fire-brick, liberally interspersed with cooling plates, made of bronze and so arranged that water flows through inclosed channels.

Beginning at the hearth there is one row of cooling plates, and directly above come the tuyeres, 10 in number, arranged about a common center. These are the openings through which the air blast is forced into the furnace. They are well protected from the intense heat by circular cooling cones, one fitting within another, and the last or smaller one, projecting into the furnace 7 in. This is the tuyere proper.

Above the tuyeres come alternate courses of cooling plates and brick work. The brick are encircled with iron bands that bind the brick and support the enormous load of the stock or charge. These extend as far as the mantle.

THE STACK

The stack, inclosed in a shell, begins at the mantle and extends upward to the top. The shell is made of riveted boiler plate. Inside a lining is built of first-class fire-brick for about two-thirds of the distance up, and the remaining third of second-class fire-brick. Common brick is used for backing between the fire-brick and the shell. The lining extends to the hopper at the top of the furnace.

The top of the furnace is fitted with the apparatus for feeding the ore, coke and limestone. The hopper, or large receptacle, shaped like the mouth of a funnel, receives all substances that are charged into the furnace. The bottom of the hopper is closed by a cone-shaped casting called a bell. Below is a larger bell, the two forming a double seal. The bells are operated by steam cylinders and levers independently.

The method of operation is for the small bell to be lowered. After the charge has been discharged into the hopper, allowing the ore, coke and limestone to fall down around the large bell, the small bell is raised, after which the large bell is lowered, whereupon the charge drops into the interior of the furnace. The mechanism is operated from the ground and is supported by a structural steel frame called the head frame, which also supports the bridge on which run the cars carrying the charges. This bridge is called the skip bridge, the cars being called skips. Each car has a separate track, one directly over the other, the lower end of the bridge terminating in a pit, enabling the cars to pass below the ground level for convenient loading. The cars are operated by an electric hoist, so arranged that one car acts as a counterbalance to the other. The engineer who runs the hoist also operates the bells. By means of an indicator he can tell the exact position of the bells.

UTILIZATION OF GAS

Directly below the top are two openings in the walls of the furnace. These connect with a large pipe called the "downcomer." This pipe leads the gases to the dust catcher, a tank-shaped contrivance, where the dust is partly removed. The downcomer is connected with the gas washers, where the gas is washed and purified.

From the gas washers one gas main leads to the boilers, where the gas is burned to generate steam for the blowing engines. The other gas main leads to the stoves.

THE STOVES

The stoves are large cylindrical, dome-capped, brick and steel structures which stand beside a furnace stack. The stoves, of which there are four for each furnace at the Minnequa works, are completely filled with a cellular mass of fire-brick so arranged that there are numerous spaces to allow the free passage of gases and air, similar to the brick work in the regenerative chambers of an open-hearth furnace. The passages are so arranged that the gas in passing through the stoves travels to the top of the stove and then down.

The passages are supplied with valves at both ends, so that the gas can be controlled. The valve on one side is called the "chimney valve," that on the other side being known as the "hot-blast valve."

The gas passes from the gas washer to a burner, which can be thrust into the stove or withdrawn. The gas having been ignited and the flame directed into the stove, it passes up to the top and then down and out through the chimney valve, when it continues through a flue that connects with the big chimney, which furnishes draft for the stoves. At regular intervals the gas is shut off and the blast from the engines made to pass through the heated passages on its way to the furnace. The brick-work gives up to the air which is about to enter the furnace a large portion of the heat which it has absorbed from the burning gases.

TAPPING IRON

OPERATION OF THE FURNACE

From the top down to the hearth, the stock in a furnace during operation is in various states of chemical change. At the top the coke in the charge is not ignited, but as it gradually descends in the furnace, combustion takes place. At the tuyeres is the maximum temperature, due to the rapid rate of combustion of the coke at this point where the supply of air is most abundant. Without going extensively into the chemical reactions that take place in the furnace, suffice it to recall that as the coke is ignited and burned in a confined space and with what is, comparatively speaking, a limited amount of air, carbon monoxide is formed. This gas at a high temperature percolating through the ore, also at a high temperature, takes up part of the oxygen in the ore, reduc-

ing the oxide to metallic iron and converting the gas to carbon dioxide. The red-hot coke, in contact with the ore, also probably takes up from it directly a certain amount of oxygen. In either event, as a result of a series of reactions which are probably very complicated, the iron ore is reduced to metallic iron, which in turn is melted and flows down upon the hearth, together with other parts of the charge which also become liquefied by the intense heat. The iron, being the heaviest constituent, gravitates to the bottom and the slag, consisting of the waste material of the ore, flux and other foreign substances, rises to the top. This difference in the specific gravity of the iron and slag makes the process of separation comparatively easy. The slag is drawn off at the upper or "cinder notch" at frequent intervals. The iron is tapped about every four hours through the iron notch lower down.

HANDLING THE PRODUCT

When the iron notch is to be tapped a considerable thickness of baked fire-clay and ganister must be drilled through before the iron will start, but when the iron begins to run it rapidly enlarges the hole. When all the iron has been drawn out the notch is closed with a mixture of clay by means of a "mud gun," which has a reciprocating piston, operated by steam, and a plunger that forces the mud into the notch where it is soon baked by the heat.

PIG-CASTING MACHINE

The iron is tapped into ladles or pots of 20 tons' capacity mounted on cars. These are hauled to the bessemer or to the open-hearth steel department or to the pig casting machines, by small locomotives. At the steel departments the ladles are lifted by cranes from the cars, and poured into the hot-metal storage reservoirs. There are two pig-casting machines made by Heil & Patterson, with a daily capacity of 1000 tons each. The molten metal is poured through a spout from which it flows into a series of molds, which are slowly conveyed through a water tank to a point immediately above the cars, into which the pigs are dropped automatically.

The slag or cinder from the furnaces is drawn off into pot cars, and is carried at a high rate of speed along a railroad spur, four miles long, to reservoir No. 3, along the bottom and sides of which it is dumped. By this ingenious arrange-arrangement the problem of slag disposition is solved, and the loss of water due to seepage from the reservoirs is reduced.

Proposed Law for the Creation of Mine Drainage Districts

The following are some of the more important provisions of the law proposed by the American Congress for the creation of mine drainage districts:

"Any number of persons, not less than 10, owning and operating mining claims in any mining camp or district, whose aggregate valuation for purposes of taxation within said district shall be not less than one-third of the total assessed valuation of any property situated within the boundaries of the proposed drainage districts, may at any time file with the clerk of the district court of the county in which such claims are situate, a verified petition addressed to the judge of said district court, praying for the organization of a mine drainage district."

Notice must be given to all parties interested and provision is made for the statement of objections, etc.

"In order to provide for the payment of the expenses of the drainage, or for the payment of any issue of bonds, the board shall have power to levy and cause to be collected a tax upon all mining claims and premises within the district. Such tax shall be voted only at a regular meeting of the board and shall not exceed in any one year 50 mills on every dollar of valuation as shown by the assessment roll of the county assessor.

"The board shall have power to borrow money necessary to carry out the system of drainage adopted by the issue of bonds bearing interest not to exceed 8 per cent. per annum, payable at the office of the county treasurer in even sums of not less than $500, and such bonds shall be a lien upon all property within the boundaries of the district."

The Gilmore Mine, Idaho

BY ROBERT N. BELL*

The Gilmore mine, Lemhi county, Idaho, in 1906 shipped something over 1500 tons of high-grade lead carbonate ore and concentrates containing an average value of 60 per cent. lead and 30 oz. silver per ton. The total milling equipment consists of four home-made jigs and a small rock breaker connected to a small steam plant. This crude equipment produces 60 per cent. concentrates, but it could hardly do less with 30 per cent. feed. The tailings run 16 per cent. lead and 8 oz. silver.

The mine is at a disadvantage by reason of poor transportation; it is situated 85 miles from the railway, to which point the ore has to stand a wagon-haul charge of $10 per ton. A subsidiary company was formed during the past year, which put on a "Best" traction engine of 100 h.p. capacity, using coal fuel and hauling four steel wagons with a total load of 40 tons. It makes a round trip from the mine to the railroad and back in four days. This train, however, was put out of commission by storms late in November, but it is believed it will be able to reduce the cost of delivering the ore to the railroad next season fully 50 per cent. There is some strong talk at the present time of building a railway branch from the Oregon Short Line into the Gilmore district.

Nodules made from pyritic cinder, concentrated magnetite and flue-dust have been used in a number of blast-furnace plants. The proportion in some cases has amounted to 50 per cent. of the ore mixture and the results have been satisfactory. The binder used consists of any adhesive hydrocarbon or carbohydrate compound, such as tar, pitch, asphalt, petroleum residuums, dextrine, molasses, glucose, etc. The adhesive binder drops or is sprayed into a stream of fine ferruginous material as it enters the upper end of a rotary kiln and coheres into masses which are broken into lumps or nodules. One per cent. or less of any adhesive binder is sufficient. As the lumps reach a zone of higher temperature in the kiln, the sulphur and the binder are volatilized and when the nodules approach the hottest end incipient fusion occurs and the nodule becomes permanent.

*State inspector of mines, Boisé, Idaho.

GOLD MINING IN WEST AFRICA

The Producing Mines in the Gold Coast Colony and Ashanti

BY W. FISCHER WILKINSON*

The gold production of the Gold Coast Colony and Ashanti, for the ten months, January to October, 1906, was 175,233 bullion oz. of an estimated value of £665,000. The production for the whole year will approximate 215,000 oz. bullion, of a value of £817,000.

The figures for previous years are as follows:

Gold Production, Gold Coast Colony and Ashanti.	
1902	£ 96,880
1903	254,790
1904	378,480
1905	653,820
1906, estimated	817,000

The following are the leading producing mines:

	1906.	Bullion Oz.
Ashanti Goldfields	Jan.–Nov.	34,738
Abbontiakoon	Jan.–Nov.	34,873
Abosso	Jan.–Nov.	32,363
Akrokerri	Jan.–Nov.	21,439
Broomassie	Jan.–Nov.	12,758
Bibiani	Jan.–Oct.	*24,821

* Fine oz.

MINES OF THE GOLD COAST

The following notes are extracted from a report made by me during the year for the new Gold Coast Agency, Ltd.:

The gold mines of the Gold Coast Colony may, for convenience, be grouped into three divisions: Mines working the auriferous conglomerates (banket); quartz reefs; and alluvial deposits (dredging).

An analysis of the gold production of 1905 shows that the different districts produced gold in the following proportions: Banket mines, 32.5 per cent.; quartz mines, 61.8 per cent.; dredging companies, 5.7 per cent.

The banket mines are situated in the district of Taquah, a village which lies about 40 miles from the coast, and which is connected with the port of Sekondi, having fair facilities for landing cargo, by a railway of 3 ft. 6 in. gage.

The outcrop of the conglomerate beds, which have been extensively worked by the natives in the past, has been traced for a length of about 20 miles in a line more or less parallel with the coast. The whole length of outcrop is portioned off into blocks or concessions, of which four are being worked on a large scale at the present time. The Taquah mine has a ten-stamp mill, crushing development rock, and a new 50-stamp mill in course of erection. The Abbontiakoon, Block 1, is crushing about 5000 tons a month with a dry-crushing plant. The Abosso and Wassau mines have each a 30-stamp mill and cyanide plant.

OCCURRENCE OF BANKET

The old workings of the natives consist of numerous small circular pits sunk close together along the outcrop. Even with this primitive method of mining, a considerable tonnage of ore has been removed. The old workings indicate the position of the best values, and it is on these old workings that the leading mines are located. Although it is not certain that the absence of old workings is conclusive proof that no payable banket occurs, it is probable that this is the case, or at all events that the reef is in such places of low grade. The results obtained from surface, adit levels and borehole samples tend to confirm this opinion.

The banket bears a close resemblance to the Transvaal ore, and is a simple ore to treat by the ordinary amalgamation and cyanide processes. The banket reef or reefs (in some cases only one reef is being developed, in others two) vary considerably in thickness, but have on an average about 3 ft. of banket. The greatest depth so far reached by the mine workings is 1000 ft. on the incline, which depth has been attained at the Abosso and Wassau mines, and the continuation is further established by boreholes. The formation inclosing the reef is sandstone, which forms fair walls, so that stoping presents no difficulties.

As to the value of the banket, the records of the crushing mines form the best index. The Abosso mine has recovered during 1905 from 31,259 tons 68.6s. per ton. During the first six months of 1906 the recovery has been 66.2s. per ton. The Wassau mine recovered in 1904 65s. per ton, and in 1905 48s. per ton milled; the Abbontiakoon has put through 47,840 tons, yielding about 42s. per long ton, or, say, 37s. per short ton. The Taquah mine has been crushing unsorted dump ore for some months, and getting recoveries of from 48s. to 68s. per ton. These figures demonstrate that high-grade ores occur. A reduction in grade may be looked for as the mines get more fully developed, and as working costs are reduced. The indications are that on the ore chutes an average recovery of from 40s. to 50s. per short ton may be maintained.

WORKING COSTS

Working costs are at present considerably above the Rand level, but they are rapidly coming down. The high cost of administration and of white labor is the main factor that makes the coast compare unfavorably with the Rand. For the purposes of comparison, working costs may be regarded as made up of three main items—supplies, native labor, and white labor. As regards supplies, there is, with the exception of fuel, no great difference between the prices paid on the West Coast and in South Africa. Coal which represents about 10 per cent. of the working costs, costs 46s. per ton, as against 14s. on the Rand. But the majority of the mines still burn native wood, which they claim is cheaper than coal.

Of native labor, the West Coast has at present a sufficient supply, and the wages paid average less than those paid on the Rand, where the average cost, including food and compound expenses, of an unskilled laborer is about 2s., while on the West Coast the average pay of a native, skilled and unskilled, is 1s. 9¾d. The average native on the West Coast is not so efficient, in my opinion, as the average native in South Africa, but on the West Coast the industry has not been so long established, nor is the labor so well organized or supervised. The material is on the whole good, and the West Coast has the advantage of being able to employ the native on skilled work, which is prohibited in South Africa. Many of the natives have been taught trades at the mission schools, and make good mechanics, carpenters, drivers, etc. This is an important point, because the country cannot support, for climatic reasons, a white industrial population as on the Rand. Indeed, the success of the field is, in my opinion, largely dependent on the trouble taken to train the native to occupy the higher positions of labor.

At the present time working costs are considerably higher than in South Africa. The lower costs, including development and London expenses, in the banket district on a 30-stamp basis are in the neighborhood of 40s. per ton. Taking into consideration the fact that the mills have been running only a short time, and that experience has had to be paid for, and also that the plants are small, a considerable reduction may be confidently looked for in the future. As regards the health of the white employee, I found that the attention paid to providing good accommodation in camps well cleared of jungle, and fresh food from the steamers has had a marked effect on the health statistics. Where attention had been paid to these points the health of the camp was good. I met several men who had had no fever, although they had been on the coast for several years.

The Gold Coast Railway is now in fair working order, but high rates continue to be charged. The railway is handicapped by the heavy cost of construction, the rates being framed to pay interest on the capital expenditure as well as the running and maintenance charges. The policy appears to be to get as much out of the mines now working as possible, and not to look for increased profits from the expansion of the industry that cheaper rates would encourage. Goods are classified into five classes and carried at the following rates: Class I., 2s. 6d.; Class II., 2s.; Class III., 1s. 3d.; Class IV., 7½d.; Class V., 5d. per ton mile. Besides these classes some goods such as patent fuel, local pro-

*Mining engineer, London, Eng.

duce and timber are carried at special rates. Machinery belongs to Class II., and is carried at 2s. per ton mile. Rails and cement at 1s. 3d. per ton mile. Patent fuel is carried at a special rate of 8s. per ton for any distance up to 50 miles, and 1d. per mile beyond that distance. Bullion travels at the rate of ½d. per £100 per mile.

THE MINES OF ASHANTI

The principal quartz reef mines are the mines of the Ashanti Gold Fields Corporation, the Akrokerri, the Bibiani mine, the Prestea and the Broomassie mines. The Ashanti mines are grouped round Obuasi, a station on the Gold Coast Railway, 124 miles from the coast. There are two mills of 40 and 50 stamps respectively. The ore is mined from a number of parallel reefs. The workings have so far been principally above adit level, and development work in depth has been backward. The Ashanti group have produced a good deal of gold. From 1898 to June, 1905, there have been milled 218,160 tons, yielding gold to the value of £538,397, or 49.2s. per ton.

The Bibiani mine, in the Sefwhi district, suffers from being a long way (70 miles) from the railway. There is a 40-stamp mill, and the returns for the first six months of 1906 show 17,599 tons milled for a recovery of £58,838 or 66.8s. per ton.

The Prestea (Block A) and Broomassie workings are on one strong wide reef, which has been traced for a considerable distance. The Prestea mine is about to crush with 50 stamps, the development being well ahead, and should give good returns.

The Broomassie mine has a 20-stamp mill, and treated during 1905, 7124 tons with a recovery of 34.7 dwt. per ton. From January to June, 1906, 6036 tons have been milled, yielding gold to the value of £29,238. The reef is inclosed in a treacherous rock, locally known as a graphitic schist, which makes stoping dangerous.

The Akrokerri mine is situated near Obuasi. It has a 20-stamp mill. During 1905 there were 20,462 tons milled, returning an average yield of 88.4s. per ton.

Quartz mining in the colony promises to be profitable. Up to the present the mining companies have not done well, owing to the lack of railway communications and insufficient development. Now that these difficulties are being removed, the best mines ought, before long, to become dividend paying.

The dredging companies are as yet of small importance. They work on the Ankobra and Offin rivers. For the year 1905 they won gold to the value of £37,292.

The labor employed in mining in 1905 was 504 whites and 12,465 natives.

No. 3 stack of the Carrie group of the Carnegie Steel Company at Pittsburg has made a remarkable record, having been in blast continuously for six years.

South America in 1906

BY J. P. HUTCHINS*

The record of South America for the past year is not one of either general success or hopeful promise for better results. General things have been predicted for this great area, almost equal as it is to that of North America. It is not difficult to account for the circumstance that, with its physiographic advantages, South America still possesses great areas which have never been investigated even in the most cursory manner. There are three particular reasons, namely: a trying climate, poor transportation facilities and unstable governments. At low elevations in the tropics these difficulties are at their worst. Good transportation and stable government are encountered in the tropics only in countries whose flagging energies are constantly stimulated by the arrival of newcomers from temperate zones.

The countries lying in the south temperate zone are, largely because of more favorable climate, ahead of their neighbors in the tropics in matters of transportation and government. There are many difficulties of transportation which are common to all extremely rough and mountainous regions, and all schemes for the building of railways in any of the countries, including either the main Cordilleras or their many ramifications, must encounter engineering problems of great magnitude and corresponding high cost of installation.

It is interesting to note the statistics of the total gold productions of some of the countries of South America. Colombia is credited with $895,000,000; Brazil, $720,000,000; Bolivia, $199,000,000; Peru, $119,000,000; and Chile with $33,000,000. (This JOURNAL, March 31, 1906.) This makes a grand total of nearly $2,000,000,000, about one-fifth of the total world's production. The figures are significant and suggest possibilities for further development and lucrative exploitation with modern economic methods.

In South America, as in all partially developed regions, the more important mines are the placers, and the major part of its gold product is from alluvial deposits. There have been no developments during the year of extensive, rich auriferous deposits, and no noteworthy new exploitation. There were a number of installations of hydraulic mining machinery, with varying success. Several dredges were built, and dismal failure is to be noted in most cases; not because the ground was poor, but by reason of faulty and unsuitable design and construction. In Tierra del Fuego successful dredging has been conducted.

Areas of platiniferous gravel, seemingly well suited for exploitation by the hydraulic and dredging methods, have been developed in Colombia. The high price of platinum makes these districts particularly attractive at present. An area of diamantiferous and auriferous alluvium has been investigated on the Jequitinhonha river in Brazil and a dredge has been shipped to exploit it. Oil of paraffin base is said to have been found southwest of Cartagena in Colombia.

There have been no noteworthy developments in vein mining, and inasmuch as this kind of mining suffers most by reason of the backward conditions generally prevailing, this industry is in a bad state. One laudable attempt to work an auriferous vein near Guaymal, in Colombia, has had an unfortunate outcome by reason of the loss of the surface plant by fire. The work at Cerro de Pasco, in Peru, is progressing favorably and investigation of areas adjacent to the copper-producing district, has shown the existence of a fair grade of bituminous coal, which is being worked.

The asphalt deposits of Venezuela, noted for the high grade of the product, are not being worked extensively. There are several good reasons for this fact. First, and most important, is the limited demand, which is largely satisfied by the more accessible, though less pure, deposits near La Brea, on the coast of Trinidad. The difficulties due to the unstable conditions of the government and the uncertainty of the rights granted under the concession by which the deposits are held and worked also prevent active exploitation. Here is an excellent example of what occurs in different parts of tropical South America. The asphalt deposits, which are said to be practically inexhaustible and are remarkably pure and well situated for working on a large scale, are because of difficulties entirely foreign to the actual work of mining lying practically idle. There are parallel cases in other countries. The metal miner, operating under the mining regulations, is not greatly disturbed even in times of uprisings.

The nitrate deposits near the boundaries of Peru, Chile and Bolivia were extensively exploited, and this valuable mineral is found in such large volume that it will probably last a century.

Iodine, a by-product of the saltpeter industry, is produced in Chile alone to the value of more than $1,500,000 per year.

*Mining engineer, 52 Broadway, New York City.

Oil for Mexico City

Consul-General A. L. M. Gottschalk reports from Mexico City that within a short time work will be begun by an American concern, which has just signed its first contract with the department of fomento (interior), upon a pipe line from the oil fields in the neighborhood of Tampico to the City of Mexico.

The touchstone of the jeweler is known as basanite, a silicious rock or jasper of a velvety black color.

WEAK POINTS OF THE FEDERAL LAW IN RELATION TO MINERAL LANDS

The Law of the Apex and Extralateral Rights—Suggestions for Preventing Abuses—The Claims in the Flagstaff Case—Location Corners

BY GEO. W. RITER *

In advocating such changes in our mineral land laws as will do away with the extralateral right in future mining titles, the American Mining Congress, at its recent meeting in Denver, has again voiced the sentiments of thoughtful mining men. But the law of the apex, much as we are anxious to get rid of it, is not the only bad feature in our present mining code, and perhaps not the worst one. The feature which permits the exact boundaries and rights of a mining location to be left in a loose, indefinite state for an unlimited period of time, without any record in the United States land office, is not praiseworthy.

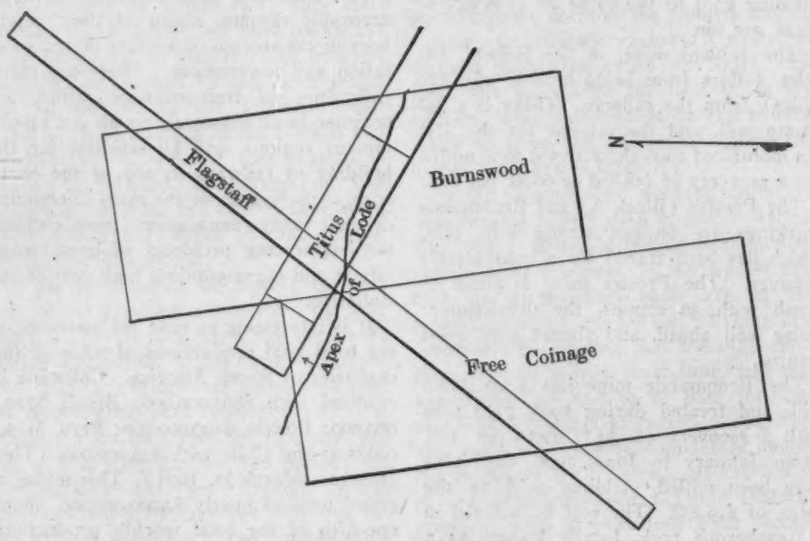
It is becoming more and more difficult, as time goes on, to find out what lands are held under a valid right; and there is no way of forcing a claimant to define his rights fully except by the expensive and doubtful process of making a location, doing the necessary development work, and then filing an application for patent in the land office, there to await a protest and adverse claim. A claimant is not even compelled to use due diligence toward maintaining his location corners. Proof of the common laxity in this matter is to be found in official notes, filed in the land office, of mining claims surveyed for patent; these notes show that in a surprisingly large number of cases, the location corners could not be found by the surveyor at all, or were not in the places contemplated by the location notices.

THE FLAGSTAFF CASE

A concrete example of the weak points of our present law is to be found in the Little Cottonwood mining district, in Utah, in two mining claims, the Flagstaff and the Titus, both of which became famous through litigation ending in the classic decision of the Supreme Court of the United States in the so called "Flagstaff case." During all of the years following its location, the Titus claim was never officially surveyed and consequently never got on the records of the United States land office. The location corners lost their identity and the development work was done through underground workings which opened to the surface on other lands. Finally there was nothing on the ground, or on the maps, to suggest any existing rights within the area once covered by the Titus. Yet the claimants were able to block an application for patent, made by parties who had located and improved what seemed to be vacant ground.

Active mining operations were at a standstill, and might have remained so indefinitely except for a consolidation of conflicting interests under which the new claims were allowed to go to patent and the historical Titus claim ceased to have a legal existence.

But note the boundary lines of the Titus and the direction of the lode in the map, both copied from the report of the Supreme Court of the United States in the Flagstaff case. Note also the boundary lines



CLAIMS INVOLVED IN THE FLAGSTAFF CASE

of the Burnswood and Free Coinage, the new claims which have superseded the Titus. What about extralateral rights now? Other conflicting and adjoining claims exist to complicate the matter still further; but inasmuch as all have passed into the hands of a common owner, the question of extralateral rights will hardly be raised again.

The point of it all is that the prudent mining man has learned how risky an extralateral right really is, and knows that by getting additional areas he can make the law harmless so far as he is concerned. He wants the law so amended, however, that he can find out promptly where any valid rights exist and what the rights consist of.

LAWS SHOULD SUIT THE NEEDS OF THE PROSPECTOR

But in trying to make mining rights more definite, there is danger of making the law too complex. We must bear in mind that the men who make the first discoveries and set up the first mining rights are not usually men of great learning. Our laws should be framed to suit the needs of the prospector, the buoyant, hopeful nomad, who disregards hardships and privations, and roams through regions where none of the rest of us care to go until attracted thence by his discoveries. The present law has always appealed strongly to men of this class, because of the very simple procedure for initiating and maintaining rights.

We have gone so far in our interpretation of the law in the matter of what constitutes a valid discovery and with reference to the time and manner of doing development work, that we have made room for a class of speculators who take up mining ground, not with the slightest intention of developing it, but hoping to get a price from the man with bona fide intentions. Since any so called "discovery" seems to satisfy the law, and since there is no limit to the number of claims one man may locate, it has become common for these persons to locate large groups of claims in the neighborhood of some promising prospect or mine, and then to wait for the ground to become valuable through the success of an industrious neighbor. These vampires seldom make preparations for development work until the last thing, and then they carry on the work only in case somebody else appears on the ground for the purpose of making a location after the close of the year. If nobody else appears, no work is done. With the new year, new names are given to the claims and new location notices are posted and recorded; and the property is held for another twenty-four months without any real development work being done at all. Some States have tried to overcome this evil by requiring a discovery

*Mining engineer, Salt Lake City, Utah.

hole of some specified depth to be dug on each claim as a condition for final location, but this remedy has not been wholly adequate.

CHANGES SUGGESTED

The details of the new law will need careful consideration, but it may not be out of place to suggest the following general changes:

1. Do away with the extralateral right.
2. Require the holder of a claim to apply for patent within a given number of years, and make it incumbent on him to keep his location corners up until the claim is officially surveyed.
3. Place a limit on the number of locations that one individual or association of individuals may make in the same district, within a given time.
4. Provide that the annual development work contemplated by the law shall be completed, not merely be begun, before the close of the calendar year.

Mining in Eastern Washington in 1906

BY M. H. JOSEPH

FERRY COUNTY

Eastern Washington has witnessed an awakening from its hitherto usual lethargy in mining during the past year, and several important developments have been recorded. Ferry, it is true, has not kept apace with the neighboring counties, which is partly due to a lack of a suitable method for treating the dry ores of Republic, the principal camp. Prof. William B. Potter, of the St. Louis Sampling and Testing Works, of St. Louis, Missouri, after thoroughly sampling the mines, satisfied himself that he could mine and treat the highly silicious ores of the camp having a value not exceeding $6 per ton with profit, provided that the mines could be operated and developed under joint management, on a very extensive scale. Mr. Potter has made proposals to the mine owners which are under consideration.

During 1906 the Pearl Consolidated and San Poil were worked, but both suspended operations to await the development of a milling process suitable for the home treatment of their products.

At Belcher camp, 12 miles north of Republic, considerable activity has been displayed during the year. The Belcher Mountain Railway Company has constructed a narrow-gage railway eight miles up Lambert creek, from the Washington & Great Northern Railway, to the Belcher mine, and also built commodious ore bins at the lower end of the line. The mines worked were the Belcher, the Winnipeg, the Oversight, the Copper Key, the Anonymous group, the Mineral Hill and the Meteor. New companies organized and beginning work were the Bartle Gold Copper and the Quinn. The Monitor group changed hands, and the Adelphi group, on La Fleur mountain, was sold to the Dominion Copper Company.

OKANOGAN COUNTY

Among notable events were the discovery of wolframite in the Cascade mountains, and the organization of the Tungsten Consolidated Mining and Milling Company to work the deposits.

One of the Palmer mountain tunnels, already in 4000 ft., is to be driven 4600 ft. farther into the southeastern flank of Palmer mountain. John Boyd, the manager, has secured the capital necessary to complete it. Last year the company finished and equipped a $50,000 electric-power plant on Touts Coule creek. The company purchased the equipment for a 100-stamp mill of the Traylor Engineering Company, and has begun extending its tunnel. Other promising enterprises are the Copper World, the Copper World Extension, the Judge, and the Kimberly.

In the vicinity of Palmer lake, and northward, along the Similkameen river, mining activity has increased steadily during the past three years, and now that railway transportation will be available within a short period, every effort is being bent toward getting ready to ship ore to reduction centers at the earliest moment. The Ruby, Mountain Sheep, Q. S., Prize, Rich Bar, Security, Horn Silver and Triune mines all made progress during the year. Electric power from the Similkameen falls power plant will be available early in 1907, when mining in this section will be revolutionized through the use of machinery.

The Mountain Sheep has been accelerated by the instalment of a gasolene power plant and there is talk of establishing a commercial smelter.

In the Chesaw district new capital has been secured, and work done at several mines, including the Poland China, Mail River, Olentangy, Bimetallic, Jack Pot, Ben Harrison, Interstate, Saranac, Old Germany, Opal, Butcher Boy and Bluffton. Placer work was done by the Allen Placer Company. The completion of the Victoria, Vancouver & Eastern Railway will furnish transportation to the district.

The discovery, in 1905, of antimony at the White Stone ranch, near Loomis, opened a new field of industry, and during the latter part of 1906 Ingham & Witcher shipped from the discovery 400 tons of stibnite to San Francisco on a special order.

In the Methow district the Antimony Queen Mining Company operated the Dixie Queen mine, on Gold creek, last year and shipped several large slabs of stibnite to San Francisco, which weighed from 500 to 1000 lb. each. Since then the company has been shipping ore in carload lots. The Seattle Smelter Company has ordered machinery for a 10-ton antimony smelter, to be installed on the Gold creek antimony belt next spring, and if it proves successful, a plant will be installed to handle the entire output of the district.

In the old Ruby camp, near Conconnully, last year's operations were quite extensive.

The western part of Okanogan county showed more than usual activity during 1906. In the Twisp district a number of mines were worked, with encouraging results. Among them are the Lookout, the Alder, the Gold Dollar and the Bonita.

The Chelan district has a number of excellent mineral showings, upon which considerable work is being done, and while they have not been developed into paying mines, they are a good deal more than mere prospects. The orebodies of this district are unusually large, and the values fairly good, but the lack of transportation has retarded development. Last winter J. P. Graves, of Grand Forks, B. C., took a bond on the control of the stock of the Holden Gold and Copper Mining Company, which is showing excellent values in copper.

STEVENS COUNTY

All of that part of the Colville reservation in Stevens county tributary to Orient, a town in Ferry county, on the line of the Washington & Great Northern Railway, has experienced unprecedented mining activity during the past year. Under competent management several mines in this section, including Kettle river and Pierre lake districts, demonstrated their worth in 1906. Among them are the First Thought, Napoleon, Easter Sunday, Orient, Pomeroy, Chief and Butte, Minorca, Swamp King, Abe Lincoln, Globe, Regina, Copper Butte, American Flag, Trojan, Tenderfoot, Big Iron, Defender, Golden Crown and several others, which are under development.

The Metaline district became prominent last year through several mines with large deposits of silver-lead ore, the principal being the Morning and Mammoth. Several other companies are operating in the district, and a large amount of work was done, chiefly in tunneling.

Cedar cañon district the past year has experienced prosperity, mainly through the purchase of a group of claims, on which a good quality of tungsten ore was discovered, and the introduction of capital by the Krupp Steel Company, of Essen, Germany, which purchased the claims last fall and have since been industriously blocking out ore. This company has ordered a concentrating plant.

In the Chewelah district, which was discovered 20 years ago, some discoveries of copper ore were made last year, and the development of silver ore in some of the mines was reported. The United Copper Mining Company purchased three claims and a fraction, and owns five others on which development is in progress. The Jay Gould mine became a shipper of silver-lead ore to the Tacoma smelter last fall.

THE MINES OF COBALT

The Kerr Lake or Jacobs, Right of Way and Trethewey Mines—Leasing by the Railway Commission—A Claim Four Miles Long

BY REGINALD MEEKS

The silver mines of Ontario are peculiar for their similarity in some respects and for their wide variance in other ways. Some of the mines seem to run to but one class of ore, while in others there is found a varied assortment. While argentiferous smaltite is the rule, still there will be found heavy showings of niccolite in other sections. Native bismuth and the antimonide of silver (dyscrasite) will appear in some mines and be foreign to others.

The general character of the fissures is similar, but in certain sections the wall-rock is more shattered than in others, and in some cases portions of the walls themselves are sufficiently rich for one or two feet to warrant breaking down and sorting. Pieces of wall at the Trethewey were shown which were covered with thin leaves of silver. There have been 39 different minerals found in the district, some of which have not yet been classified.

Kerr Lake Mining Company

This property is better known, locally, as the Jacobs mine, and consists of 52 acres in the north half of lot 3, concession 4, on the shores of Kerr lake. The discovery was made in 1904 by M. T. Wright, and the land was acquired in 1905 by the present owners. Considerable development has been done and the ground has been found to be well mineralized.

CHARACTER AND EXTENT OF VEINS

There have been discovered to date 15 veins, 5 of which are considered to be of most importance. They have no uniform direction, but strike in all positions of the compass, but with a general trend to the north and south.

No. 1 vein strikes east and west, and has been worked by a 100-ft. open cut for a depth of 50 ft.; it averages 1.5 in. of argentiferous smaltite and ruby silver.

No. 3 is considered the main working and is shown in the sketch. A tunnel has been driven into the base of a low hill for a distance of 225 ft., and the ore stoped out for a hight of 50 ft. for the entire distance. At the entrance of this tunnel a shaft was sunk to a depth of 130 ft., and levels were driven north and south at the 60- and 120-ft. stations. Drifting to the south disclosed highly mineralized rock, and the ground is being stoped at a distance of about 30 ft. from the shaft. Within the past few weeks a cross-cut was driven 12 ft. to the west at the 60-ft. level and encountered a 12-in. vein of ore which is claimed to be 25 per cent. silver.

The shaft is substantially lined with square-set timber, and is equipped with a bucket hoist which it is proposed to change to one employing a cage and car. The shaft-house and ore-house are well built, and sheathed with tar-paper. None of the shaft-houses of Cobalt seems to be built to handle a heavy tonnage or to withstand a long siege.

No. 6 vein strikes north and south and is entered by a 140-ft. tunnel. The vein shows from 2 to 3 in. of cobalt and native silver. No. 7 strikes in the same direction as No. 6, and is worked by a 60-ft. shaft. Stoping has been done for a length of 30 ft., and for a hight of 10 ft. The vein has been traced for 250 ft., and averages from 4 to 6 in. of smaltite and native silver.

No. 9 vein shows 8 in. of rich silver ore, and has been traced for 500 ft. It enters a swamp on one side and the lake on the other. A cut has been made for 160 ft. and the stoped area is 60 ft. long by 10 ft. high. The other veins run from 0.5 to 6 in. in width, and have not been worked except in the case of Nos. 8 and 12.

Of these No. 8 has been opened by a cut, 30 ft. long and 10 ft. high, which shows a 2-in. vein of smaltite and silver. No. 12 strikes east and west, and shows a small rich vein of silver. It has been opened by a cut 70 ft. long by 6 ft. deep. The vein crosses No. 7 at right angles.

EQUIPMENT

The mine is furnished with one 60-h.p. boiler; one 4-drill compressor; one 6x8 hoist; feed pumps, etc.; office; two bunk-houses; one boarding house; power, ore, pump, store and dwelling houses, and is in good shape to meet present requirements. The management is pushing development as rapidly as possible.

There were formerly 30,000 shares of a par value of $100 each. Recently these have been changed to 600,000 shares of $5 each. The stock is quite closely held, and is not actively dealt in.

About 200 tons of high-grade ore have been shipped from this mine.

The officers are as follows: Edward Steindler, president; W. J. White, vice-president; J. A. Jacobs, secretary-treasurer; I. R. Jacobs, manager, and S. W. Cohen, superintendent.

Right of Way Mining Company

This mine is an example of what may be done in this extraordinary camp. Ordinarily a tract of land 4 miles long by 99 ft. wide would be considered a rather venturesome mining risk, but in the case of this property the results so far have more than realized the expectations of the promoters. It is essentially the "freak" mine of the camp, and is laughingly referred to as the mine whose equipment consists of "seven men, three planks and a wheelbarrow, to which has been added a couple of candles for the night-shift." Nevertheless, the management has taken out of a cut, 50 ft. long, 10 ft. wide and 10 ft. deep, 30 tons of first-grade and 25 tons of second-grade ore. The former was shipped in December, and was expected to return nearly enough to clear the entire purchase price of the property.

The facts relative to the acquisition of

KERR LAKE OR JACOBS MINE

the property are also interesting. The Ontario government built the railroad now known as the Temiskaming & Northern Ontario Railway, and placed all details in the hands of a commission consisting of Cecil B. Smith, Dennis Murphy and J. L. Englehart. These men were granted, as a bonus, the surface and mineral rights along the right of way, and in all townsites along the line of the railroad.

The commission advertised for bids or, as they are called in Canada, tenders, and the following properties were leased for the term of 999 years: Right of Way Mining Company, Cobalt Townsite, Wright Mining Company, Nancy Helen, and the City of Cobalt Mining Company. The terms were a cash bonus, and a royalty of 10, 15 or 25 per cent. of the smelter returns, depending upon the value of the ore. In the case of the Right of Way the rate was 25 per cent. independent of the value and a cash bonus of $50,000. It is a peculiar coincidence that only one bid was received for this property, which was granted to five business men of Ottawa.

EXTENT OF THE CLAIM

The grant extends from the 101st to the 105th mile-post, and the width consists of 49.5 ft. on each side of the center line of the track. The station grounds are excluded, and a 3-acre tract at the northern end was included. This makes the total area very close to 43 acres, but it had the great disadvantage of being a long, narrow strip of ground.

The owners had considered selling a controlling interest to outsiders, but when discoveries of what later proved to be remarkably rich ore were made, they decided to work the veins themselves.

With an expenditure of less than $5000 they have won ore which is expected to return close to $60,000, less 25 per cent. royalty.

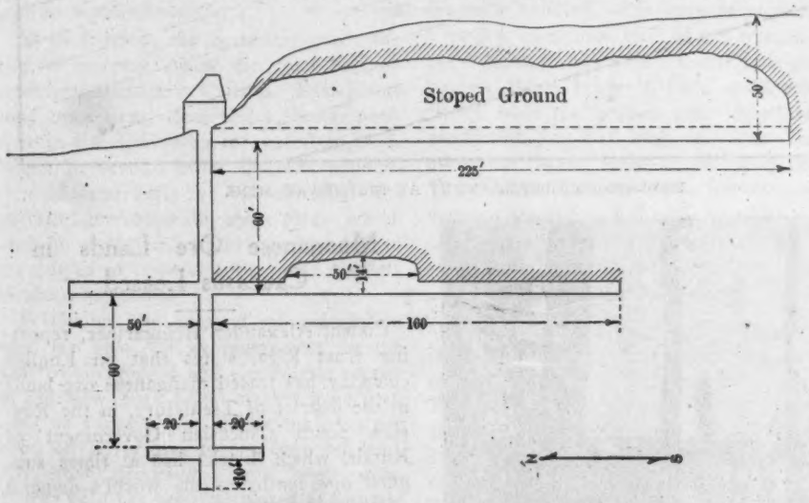
CHARACTER OF ORE

The vein is calcite, carrying considerable smaltite, niccolite and native silver, and, in the small space which has been opened, shows a width of better than 12 in. Five men are drilling by hand and one man is mucking. A shaft is being sunk at the north end of the cut, close to the La Rose boundary. It is proposed to sink this shaft and then drift to the south along the vein. At the lower or south end of the property they have two leads running from the Townsite, and a supposed extension of the Silver Queen vein. Besides this a man has offered to show the owners a discovery he claims to have made, on condition that they pay him $150 for each inch in width, and states that the vein is about 6 in. wide.

EQUIPMENT PLANS

Operations began in October, 1906, and with the equipment and force mentioned. Now the management has ordered machinery which will place them in a better position to extend development. Orders have been placed for one 25-h.p. boiler, one 6x8 steam hoist, one No. 3 Canadian-Rand steam drill, a bucket and an ore-car. At present 15 men are employed.

The company is capitalized at $500,000, the par value of the shares being $1. Five parties own the entire issue, with the exception of 100,000 shares, which remain in the treasury, and 25,000 shares, which have been issued to the public. The officers are as follows: T. A. Beamont, president; Edward Seybold, vice-president; E. A. Larmonth, secretary-treasurer; E. McMurtry, superintendent.



DEVELOPMENT ON VEIN NO. 3, JACOBS MINE

THE O'BRIEN MINING COMPANY

Litigation has been the cause of much trouble to more than one mine owner and M. J. O'Brien and J. B. O'Brian have from this cause been forced to keep idle for a long period a mine which should have long ago taken its place among the active shipping mines of Cobalt. Owing to a dispute about the title the owners have been obliged to keep a small force on the property pending the settlement of the suit brought against them by the attorney general on petition by the owners of the La Rose, the adjoining mine. The Canadian Government has finally decided the case and has granted the right to resume operations, with the stipulation that 25 per cent. royalty on all smelter returns must be paid to the Government.

Previous to the enforced idleness one 25-ton carload of ore was shipped, but between that time and December, 1906, there have been no shipments. In December the management was granted permission to ship one car, and a 50-ton car was thereupon ordered.

LOCATION AND WORKINGS

The O'Brien mine is a close corporation, owned by the men already named. It consists of 154 acres, but so far operations have been confined to lot R. L. 403, situated east of and adjoining the La Rose mine. The mine is located on the summit of the low range of hills rising from Cobalt lake, and the elevation is about 75 ft. higher than the La Rose mine.

There are six veins lying in all directions, besides many fissures; the ore is smaltite and native silver, with a good showing of argentite. Two shafts have been sunk. No. 1 shaft is down 320 ft. and, it is claimed, is in good ore at that depth. The levels are 50 ft. apart, but no drifting has been done below 150 ft. This shaft, which has one compartment, is equipped with a bucket hoist, which is to be changed to a cage in the near future. The shaft house is 30x50 ft. and 45 ft. high; it is sheathed with corrugated sheet steel. The second shaft is down 50 ft. The underground operations comprise 700 ft. of drifting, 100 ft. of cross-cutting and a 50-ft. raise to the surface.

EQUIPMENT

The power-house is 40x20 ft., and contains two 50-h.p. Ames locomotive-type boilers; one 6-drill Ingersoll & Sargent straight-line compressor, and one 8x10 Lidgerwood hoist. Since the settlement of the title difficulty it has been decided to maintain a force of 30 men underground and 50 on the surface, and to increase the equipment accordingly. The company has built a substantial camp on the property, and active mining operations should add greatly to the information concerning continuity of silver values at depth.

M. T. Culbert is superintendent of the mine.

THE TRETHEWEY MINING COMPANY

The properties formerly known as Trethewey J. B. 6 and J. B. 7 were at one time owned and operated by the same parties. The lot known as J. B. 7, consisting of 40 acres, was acquired late in the year. On Nov. 8, 1906, the officers were elected and work was begun two days later. Previous to the present régime, ore to the value of $325,000 was shipped, and the present owners have received $105,000 for their ore, including $60,000 received for shipments in transit, when negotiations for the property were concluded. Since Nov. 8, 1906, there have been shipped 50

tons of 2000-oz. ore and 90 tons of second grade running from 150 to 200 oz. per ton.

VEINS AND WORKINGS

There are a number of clearly defined veins, but so far only one has been actively worked. Along the line of contact and 100 ft. west of the shaft, there is a 12-in. vein of smaltite (not shown in the sketch) carrying 15 to 25 per cent. cobalt, and probably not more than 50 oz. silver. This vein has been opened by an open-cut for 80 ft. at a maximum depth of about 20 ft.

I am informed that Thomas A. Edison has offered 40c. per lb. for the cobalt contents of this ore to use in the manufacture of storage batteries, and is also willing to pay for all but 19 oz. of the silver which it contains. This amount, it is claimed, is lost in the extraction process.

The principal vein is opened by a shaft which has been sunk to a depth of 120 ft. Levels have been driven at depths of 50 and 100 ft., and ore has been stoped at the upper level for a distance 40 ft. east of the shaft and to the surface.

The ore exposed is in a vein 5 or 6 ft. wide which is streaky. There are probably 2 ft. of second-class, and 4 in. of first-class ore. Recent assays of the former ran 250 and 230 oz. silver to the ton. The high-grade ore runs from 900 to 4000 oz., depending upon the native silver contents.

At the first level drifting has progressed 180 ft. to the east and 50 ft. to the west. At the lower level drifting has been confined to the east and 120 ft. has been done. The ore seems to be of the same character in both levels. A stratum of what is probably the Kewatin formation traverses the property, dipping at an angle of about 25 deg. Wherever this has been encountered silver values have been found to be less. The rock formation has been located at two points and its direction estimated. Its position is shown in the sketch. Cross-cuts are being driven to the north and south and have progressed 15 and 44 ft. respectively. By cross-cutting to the south it is expected that vein A of the Coniagas mine will be intersected. This vein strikes directly toward the Trethewey property.

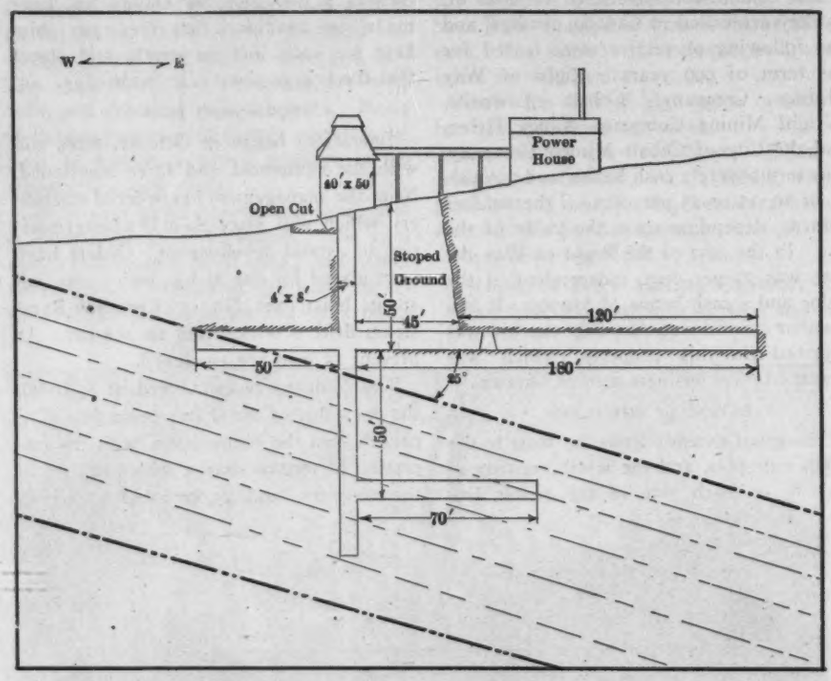
In all the underground operations overhand stoping methods are used and the policy is to push development as much as possible. Wherever there is a fracture, and they exist in all directions, cobalt ore and native silver are found. This results in a large quantity of low-grade ore running 100 oz. silver per ton and upward.

EQUIPMENT

The power house contains one 12-drill compressor which furnishes air for both the Trethewey and the Coniagas mines; one 180-h.p. boiler and a hoist.

The ore-sorting house has been very inadequate but a much larger building is almost completed and soon sorting will be done under far better conditions. At present 90 men are employed but the normal force consists of 40 men underground and 30 on the surface.

The stock issued amounts to 1,000,000 shares of a par value of $1. The officers are as follows: A. M. Hay, president; S. A. Wickett, vice-president; Frank C. Loring, consulting engineer.



UNDERGROUND DEVELOPMENT AT TRETHEWEY MINE

TRETHEWEY MINE

Manganese Ore Lands in Caucasus Leased

Consul Alexander Heingartner, reporting from Riga, states that an English company has leased manganese ore lands in the district of Tschiatury, in the Russian South Caucasian Government of Kutais, which district has at times supplied nine-tenths of the world's demand of this ore. In 1902 there were mined 415,000 tons out of a total Russian production of 536,558 tons.

The quantity of land leased is reported to be about 50,000 dessiatines (134,985 acres), at a yearly rental of 25,000 rubles ($12,875). To further transportation facilities the branch line starting from the station on Kwirilly, on the Transcaucasian Railway, is to be extended northeastward to Satscheri, then eastward to the village of Dschaba. A stock company with a capital stock of 3,000,000 rubles ($1,545,000) has been organized, divided into 16,000 shares of 187.50 rubles each.

In December the five Carrie furnaces of the Carnegie Steel Company at Pittsburg turned out 68,167 gross tons of pig iron, beating the best previous record in March of 66,250 tons. This is an average of 440 tons per stack per day.

British Columbia

BY E. JACOBS*

A considerable increase in value of the mineral production of British Columbia in 1906, as compared with that of 1905, appears to be the gratifying result of the year's mining operations. The estimated total of $25,129,875 for 1906 gives a net increase of $2,668,550 over that of 1905, which was $22,461,325—the previous record year for the Province. It is interesting to note that 10 years ago—in 1897—the total production was but $10,455,268, so that within a decade the mines of British Columbia have more than doubled their output in point of value.

By far the greater part of the increase for the year just closed was made by copper, which not only had the assistance of an advance in average price of about 4c., but was produced to the extent of nearly 7,500,000 lb. more than in 1905. Lead, lode gold, building materials, etc., also show increases, but placer gold, silver, coal and coke are estimated to have decreased during the year. There were special—but temporary—reasons for the falling off in production of these minerals, as will be stated presently.

As to districts, the Boundary made the biggest increase, being the chief copper-producing district in Canada. East Kootenay came next, occupying a similar position in the Dominion in regard to lead. While in several other districts production showed little or no increase, important developments took place which may be expected to add considerably to the output of mineral from those districts in the near future.

Following the method of calculation used last year, the average prices for the year of silver, lead and electrolytic copper in the New York metal market have been used as a basis, less deductions of 5 per cent. off silver and 10 per cent. off lead. No other deductions have been made. Placer gold has been calculated at $20 and lode gold at $20.67 per oz. Coal at $3 per long ton and coke at $5 are fair values for the Province.

The estimated value of the production, with the changes as compared with 1905, are shown in the following table:

	1906.	Changes.
Gold, placer	$ 900,000	D. $ 69,300
Gold, lode	5,167,500	I. 234,398
Total gold	$6,067,500	I. $165,098
Silver	1,902,375	D. 69,443
Lead	3,060,000	I. 660,978
Copper	8,550,000	I. 2,673,778
Total metalliferous	$19,579,875	I. $3,430,411
Coal	$3,300,000	D. $ 852 936
Coke	1,250,000	D. 108,925
Building materials, etc	1,000,000	I. 200,000
Total non-metalliferous	$5,550,000	D. $ 761,861
Total production	$25,129,875	I. $2,668,550

The following comparative table shows the quantities of minerals produced in 1905 and, approximately, those in 1906:

	1905.	1906.	Changes.
Gold, placer...oz.	48,465	45,000	D. 3,465
Gold, lode.....oz.	238,660	250,000	I. 11,340
Total gold...oz.	287,125	295,000	I. 7,875
Silver.....oz.	3,439,417	3,000,000	D. 439,417
Lead.....lb.	56,580,703	60,000,000	I. 3,419,297
Copper.....lb.	37,692,251	45,000,000	I. 7,307,749
Coal....long tons	1,384,312	1,100,000	D. 284,312
Coke....long tons	271,785	250,000	D. 21,785

Gold, copper and lead, as stated above, furnished the increase in production.

GOLD

The further falling off in placer—1905 production having previously been the lowest since 1898—is due to causes which are matters for congratulation rather than the reverse. In both the Cariboo and Atlin districts—the two chief placer-gold sections of the Province—financially strong companies are engaged in preparations for extensive operations next year or the following. The Guggenheim enterprises in both districts named are on such a scale as should add largely to the quantity of placer gold recovered after works now in course of construction shall have been completed. In the Atlin individual miners are rapidly giving place to companies, and steam shovels are superseding smaller appliances, where large quantities of gravel are to be handled. The increase of nearly a quarter of million tons of ore treated in the Boundary has added to the lode-gold output, there being a little gold associated with the copper ore. Rossland's production has well kept up. The Ymir mine has again been a disappointment. The Nickel Plate, in lower Similkameen, was not worked to full capacity of its mill, pending the outcome of negotiations for sale of the property, which was not made.

SILVER AND LEAD

The St. Eugene increased its output of lead-silver ore and consequently its silver production, and the Sullivan mine, also in East Kootenay, added its quota of silver from its low-grade ore. Boundary and Rossland helped a little, but the Slocan output was again much below expectations. The closing of the silver-lead smelters for several weeks during the strike at the Crow's Nest coal mines was in part responsible for the decrease in this metal

The St. Eugene again maintained its very considerable advantage in lead production, and the Sullivan was also an important producer. On the other hand Slocan is believed to have fallen short heavily. The Blue Bell mine in Ainsworth division will likely produce a considerable quantity of lead when arrangements for treating its big body of lead-zinc ore shall have been completed.

COPPER

It is estimated that fully three-fourths of the copper produced came from Boundary mines which in 1905, according to the "Annual Report of the Minister of Mines" for that year, gave an average assay, based upon copper recovered, of 1.52 per cent. With an output exceeding 1,100,000 tons of copper ore in 1906, an estimate of 33,000,000 lb. of copper as the district's production should be well within the mark. Rossland, with an output of about 280,000 tons of ore having an average copper content of rather less than 1 per cent., contributed between 5,000,000 and 6,000,000 lb. The coast mines, chiefly the Tyee on Vancouver island and the Britannia on Howe sound, made up practically all the remainder of the year's total of this metal. The Iron Mask at Kamloops did not work all the year, so its output was less than was anticipated it would be.

ZINC

The production of zinc received a setback by the charging of duty on zinc ore and concentrate entering the United States from British Columbia, and the non-completion of the Canadian Metal Company's zinc smelter at Frank, Alberta. Additional plant is being installed at these works, with the object of making them suitable for the economic production of zinc.

COAL AND COKE

First the destruction early in the year of a large part of San Francisco, which cut off from the Vancouver island collieries what had long been their chief market for coal, and next the recent labor troubles at the Crow's Nest Pass Coal Company's collieries, which were closed for two months and not operating to their former full capacity the following month, prevented the production of these fuels from showing an increase. During the latter part of the year there has been, though, a distinct improvement in the demand for coal and coke, but the island collieries could not get sufficient men to allow them to keep pace with it. Coal and coke from western Alberta in large measure kept West Kootenay and Boundary mines and smelters supplied during the strike, so that the stoppage of supply from Southeast Kootenay coal mines was not felt to so great an extent as would otherwise have been the case. Preparations are being made to mine coal in the Nicola district, which has lately been given railway communication.

IMPROVEMENTS AND PROSPECTS

Taking the mining districts of the Province in the order usually followed in official publications, the following comments are made:

In Cariboo the Cariboo Gold Mining Company, with J. B. Hobson as resident manager, is constructing 17 miles of ditch for water supply and doing other important work preliminary to the extensive working of its enormous gold-gravel beds. The Bear Hydraulic, also in Cariboo, is at length about ready for producing gold. The Consolidated Cariboo deep-drift mine appears to be approaching a self-supporting and probably dividend-paying period.

Atlin, in the Cassiar, has been in a tran-

*Editor *British Columbia Mining Record.*

sition state during the year, but hereafter operations will be larger. Dredge-mining in this district has proved a loss thus far. The introduction of a big steam shovel by the Guggenheim company promises to work a transformation in results of work with big gravel-handling appliances. The Berry Creek Mining Company is now in position to work its Thibert creek hydraulic gold mine profitably, having completed its water-supply system.

East Kootenay is making considerable progress in both lead-silver and coal mining. The St. Eugene mine has had its plant and machinery enlarged, and the Sullivan mine and smelter have been brought to a condition of steady production. The Crow's Nest Pass Coal Company is steadily increasing its coal and coke output.

In West Kootenay the old Ainsworth camp is again active, the purchase of the Krao mine by Butte capitalists having been the chief feature of the year. The Blue Bell in the same mining division is being extensively opened up. Developments at several Slocan properties are encouraging. Deep-level mining in the Rambler-Cariboo was the most important development of the year. On Slocan lake the successful working of the Hewitt, Vancouver group, Standard, Ottawa and other silver properties has given that section a fresh start. Nelson district has the successful development of the La Plata and the considerable improvement of the Hall Mining and Smelting Company's smelting works to credit for the year. Rossland's mines—Le Roi, Le Roi No. 2, Centre Star and War Eagle—have all been extensively developed with gratifying results, each now having more ore in sight than at any previous time. The Trail smelter and silver-lead refinery have been enlarged and improved.

The Boundary copper mines in Yale district and the smelters have made the most progress of any in the Province. The Granby, British Columbia Copper and Dominion Copper companies have, respectively, enlarged their mining and smelting operations and have been making large profits. The construction of railways to the Similkameen is having a beneficial effect on mining in that section.

On the coast the Howe Sound Copper Company has mined a considerable quantity of ore at its Britannia mines and had it smelted at its smelter at Crofton. The Tyee Copper Company has continued production and smelting at its mine and works. The Tyee orebody has been met with in the adjoining Richard III mine. The coal mines on Vancouver island are now producing to the utmost capacity practicable until more labor shall be available.

Generally the mining and smelting industries of the Province are in a better condition now than ever before, production being larger and several companies able to divide part of their profits among the stockholders.

A Notable Exhibit of Rare Minerals.

At the meeting of the New York Academy of Sciences and the Geological Society of America, held in New York, Dec. 29, 1906, to Jan. 1, 1907, Dr. George F. Kunz exhibited the great mass of true jade (nephrite), weighing 4715 pounds, which he discovered and obtained at Jordan's Muhl, Silesia, in the year 1899, and which now belongs to the Heber R. Bishop collection, being loaned to the American Museum of Natural History through the courtesy of the Metropolitan Museum of Art. With this specimen is a series of photographs of the quarry and the features connected with it, which shows how the specimen of jade was found, made by George H. Kunz, a son of Dr. Kunz; also, a specimen that was obtained at the same time and polished, showing the beauty of the material, as well as a hand fragment unpolished. This find of jade in Silesia is of special interest, as it was believed by many that the jade implements found in the lake dwellings of Switzerland, Italy and Austria had all been obtained from material of Asiatic origin and brought westward in the pre-Christian migrations. In this one mass there is enough jade, however, to make five times the number of implements that exist in the combined European museums, and there is no necessity of attributing an Asiatic origin, although some of the implements may have had such an origin .

Dr. George F. Kunz exhibited in connection with his paper before the Geographical Society of America, American diamonds from six distinct localities: three in Wisconsin, one in California, one in Alabama, and one in Indiana. With this is a series of Jasper rock, iron ore, horn-blende, corundum, and other typical minerals and rocks, which were found associated with gold in the gold washings of Brown and Morgan counties of Indiana. These are of especial interest, because a number of these rocks have been identified and also verified by Canadian geologists as being of Canadian origin, and as having been transported during the ice period from the northern shores of Lake Superior and Ontario, and probably some from as far as Ungava district, in British Columbia. Naturally, the fact that a series of minerals, varying in specific gravity from quartz to native gold six times the weight of quartz, would lead to the plausible theory that these had been transported by ice and not by river action, or they would not have been transported but would rather have been separated according to their varying densities. The subject is one of unusual interest, as diamonds have also been found in other parts of Wisconsin, Ohio and Indiana, and it is believed they all have a common origin, having been transported either in the first or second ice periods. With this collection is also shown a collection of concentrates from the gold washings of Brown and Morgan counties of Indiana, containing zircon, garnet, kyanite, feldspar, smoky quartz, gold, and notably corundum in crystals and jasper conglomerate from the province of Ontario, and a variety of other minerals.

In the archæological exhibition there was also shown with the Heber R. Bishop collection of jade, the two great volumes of the monumental catalogue, probably the most magnificent ever published for elegance of paper, variety and richness of type, and for the extensive scientific investigation connected with it. Descriptions of the book were also shown, written by Dr. George F. Kunz, who had the scientific investigation of the Bishop collection of jade in charge.

American Development of Mines in India

Consul-General William H. Michael, of Calcutta, writes that Americans are paying some attention to the mineral deposits of India, and that it is altogether probable that this will lead to the use of American capital in the development of Indian mineral deposits on the most modern lines. Under the present governmental policy this interest by the Americans is invited and encouraged, and it is to be hoped that they will not be backward in entering the field with a full equipment of American mining machinery.

In 1905 the total value of minerals taken out in India is estimated at $27,539,780. The most notable increase was in manganese ore, which went up from $648,160 in 1894, to $1,241,545 in 1905. This places India well-nigh the head of all countries in the production of this ore. The total output of manganese ore in India last year was 253,896 tons, nearly double the output for the previous year, 1904. The tons exported in 1905 amounted to 282,334, which was an increase of 127,504 tons over the export of 1904.

Barytes Mine near Platteville Camp

James Parish, of Platteville, claims to have discovered a body of barytes located about 4½ miles west of the Platteville camp. It is said that the vein has been proved laterally for more than 300 ft., and varies from 2 to 18 in. in thickness. The samples exhibited are of an unusually clean white color, and most of the ore on the dumps seems to be pure. The average depth at which the ore is found is about 35 ft.

A report states that a rich discovery has been made in the Phœnix mine, in New South Wales. A lead vein has been struck, which yields 17½ dwt. of gold, 19 oz. silver, and from 60 to 70 per cent. of lead. The seam is running in a northerly direction for 200 yards.

VENTILATION IN FLAT COAL SEAMS

A Technical Consideration of Modern Mine Ventilation with Reference to Economy and Efficiency in Non-gaseous, Low Seams

BY A.H. STOW*

It is not that there is anything distinctive or peculiar to the ventilation of a flat coal seam, but merely that this implies, within wide limits, certain conditions and volumes to be dealt with.

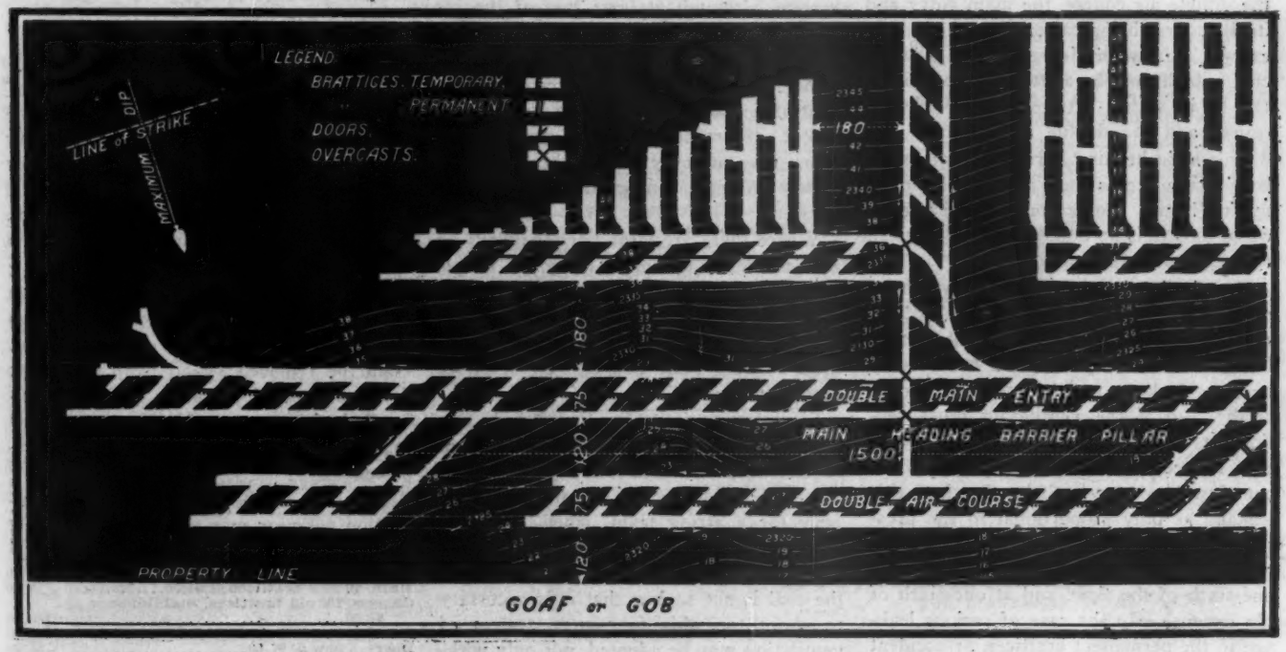
Non-gaseous is not a hard and fast distinction; often mines that have been free from gas for years, in time will show small traces of gas, then gradually increasing quantities will appear, until the mines in question may be clearly classed as gaseous or fiery.

able outcrop, where the entries have no great distance to drive.

EVIL PRACTICES THAT EXIST

Where a large property is to be worked out, and the main entry has a long drive ahead of it, away from the crop, the case is different. Such mines, however, having a fan or furnace of moderate capacity, can readily run two or three years—often do run much longer—without any serious inconvenience being felt or danger noticed.

When the point is finally reached where there is little or no real ventilation, the moving trips of cars will result in a sort of false ventilation, and in a closely gobbed low-coal haulway, such trips form quite a good piston, as it were; which form of ventilation serves admirably to distribute the dust resulting from haulage throughout the adjacent workings, until everything becomes coated with fine coal in a delicate state of balance, so that a windy shot, or the accidental discharge of a keg of powder serves again to place the dust in a state of suspension ready to propagate an explosion; still there are quite a few yet who do not at heart believe in dust explosions, while they



GENERAL METHOD FOR VENTILATING A FLAT COAL SEAM

A possible improvement in methods of ventilation, that might be quickly adopted for a gaseous mine, quite likely would be promptly turned down for a non-gaseous proposition, if there were any additional costs attached. Low coal often has to compete with adjacent high coal having much lower mining costs, so that any impovement that may involve increased costs, must be closely looked into and carefully considered.

To one accustomed to the rigid necessities of a gaseous district, the attempt to enforce the same precautions with the incidental expense, no doubt seems unwarranted, and to some extent and under some circumstances, this would seem good judgment, as in the case of a small drift property, with light cover, and consider-

Brattices that would be inexcusably leaky under considerable pressure, answer well enough as long as the entries are only in a short distance, with practically no friction to overcome, so that the brattices are under no pressure to speak of; these brattices, seemingly good enough, are gobbed up, as the entries are driven.

As the workings advance, the friction to be overcome increases, and the pressure on the brattices becomes greater, until what was only an insignificant leak at the start, becomes a serious loss of air. New brattices are put up in the same style as the old, which seemed good enough, it is only a question of time until no air reaches the face of the main, while the fan continues to show ample capacity for the property in question. In a non-gaseous mine, there is no particular time or

may not care to dispute that they are a reality.

Quite likely, by this time, the mine has reached such a depth that gas has already made its first appearance, when this mine may be said to be in a critical state, with possibly everyone off their guard. The fact that explosions continue, even in non-gaseous districts, is proof enough that there is room for improvement in methods of ventilation.

CONCENTRATION OF WORKINGS

The quick drawing of pillars as soon as the rooms are driven up simplifies the problem and reduces the cost, but one of the most common mistakes in low coal, and where it does the most damage, is in allowing workings to become badly scattered. Stone brattices have long been used, along main entries, to obviate many of these difficulties; and properly put in

*Mining engineer, Mayberry, West Virginia.

under good top that will not fall from over them, they answer well.

Stone brattices, however, are an appreciable item of cost, and to be properly put in, they require a class of workmen not always obtainable, especially in new districts. Assuming that the labor available is incompetent, it will be difficult and expensive to get a good ventilation at the working faces. One way of overcoming this trouble is to develop a four-entry system with long and practically unbroken barrier pillars between the two pairs of entries.

In cases where the main heading is being driven as close to the line of strike as advisable, two entries may be driven parallel to the main heading and its air course. This additional pair of headings, driven room width where the top will admit of it to avoid yardage for narrow work, will, for present purposes, be called the double air course, the main entry and its air course being called the double main entry. This system leaves a solid pillar of coal, which may be anywhere from 60 to 180 ft. in width, between the double air course and the double main entry.

This main-heading barrier pillar must be broken as often as the partings are moved up, to insure economical mule haulage; while 1000 ft. is no doubt more economical, 1500 ft. is a more common figure.

On a basis of one crosscut every 500 ft., one brattice may be said to replace at least six such stoppings under the old system. On this basis of replacing six brattices by one, the leakage will be reduced to one-sixth; also if the ventilating cross section has been doubled, and the pressure thus reduced one half, the leakage will be cut down to one-twelfth, figuring this leakage as only proportional to the pressure. In the case of an explosion, the air can be placed at the face of the main in one-sixth of the time, and at one-sixth of the expense. In the case of serious leakage in the permanent brattices, or accident to some of them, the trouble may be located in one-sixth of the time, which is an item in these days of close competition when foremen are pushed to their limit.

AN AID TO DRAINAGE

In the case of a heavy dip or swag across the main heading, the double air course, which should generallly be driven on the dip side, may serve as a ditch to the main. Where the lowest air course is say 270 ft. from the haulage way, and 220 ft. down, the maximum dip averaging 3 per cent., the double air course will serve as a ditch 6 ft. deep, without any cut or excavation being made for this purpose whatever. A special or extra air course may be driven around the swag that may occur, in order to enable the air to pass around the water that may be roofed in the double-air course.

The crosscuts in the main heading barrier pillar may usually be driven at such an angle that the coal coming from the double air course may be gotten out on a fair grade; where such is not the case, a special motor parting can be put in.

One of the objections that will be urged against this system is to the effect that it leaves too much coal for the last man to get, although not necessarily expressed in these words. This, however, is a point in its favor; that sufficient solid coal, preferably in the shape of large barrier pillars, should be left along the main haulway, more particularly to enable the working of a sufficient number of miners to make it profitable to finally pull back the main entry.

Where the general line of advance is up the pitch, instead of close to the line of strike, the double air course can be placed in the center, with barrier pillars on either side, between the double air course and the right and left double mains, which may properly be considered a six-entry system, although at least two of the six places, if not four, are preferably room width, if the top will admit of it.

With practically the full force of an adequate fan within 500 ft. of the face, the last 500 ft. of bratticing, in non-gaseous sections, may properly enough be only temporary affairs; even brattice cloth should answer.

Where there are large barrier pillars on either side of the main entry, to enable the final economical drawing back of the main entry pillars, the addition of the double air course will serve to place the main-heading mule haulage on a more economical basis.

Six places, four headings and two break-throughs, at four cars apiece, will require 24 cars, which is a day's work for one mule in low coal, or more particularly for a string team, which is necessarily slower. Where the double air course may be driven room width, and the coal is not so low that it is necessary to shoot top, this four-entry system of ventilation may be adopted, not only without any additional costs, but at an actual saving on brattices, sufficient to cover the cost of two extra motor switches at say $35 to $40 apiece, or to cover the cost of good stone brattices in the crosscuts.

It is thought that the importance of a large number of small leaks is not appreciated, or, at least, acted upon as it should be.

A PRACTICAL EXAMPLE

For the purpose of comparing costs, a low-coal proposition having an output of 20 cars of 30-ton capacity, or 600 tons per day for 300 working days, giving 180,000 tons per year, will be taken as an example.

While the figures may vary between wide limits, depending upon the management, conditions, etc., this mine will be assumed to have 15,000 ft., or say 2¾ miles, of cross entries, with 160 brattices, and 8000 ft., or about 1½ miles, of main entry with 90 brattices, the main entry and each of the five cross entries being assumed to advance at the rate of 900 ft. per year; figuring the break-throughs at 90 ft. centers, will make 60 new brattices per year, 10 on the main, and 50 on the cross entries.

An ordinary wooden brattice, single thickness, may be figured as follows:

1-in. plank, ½-in. strips and waste, 100 ft. b. m. @ $20 per thousand	$2.00
Labor, $1.75, 3 props and caps, $0.15	1.90
Daubing, $0.35, nails, etc., $0.25	0.60
	$4.50

The life of this brattice will ordinarily be from 4 to 5 years, so that $1 per year per brattice may be taken as the cost of maintenance. Where top is shot, or where there is much draw slate, it will usually be found, particularly in low coal, that there is considerable cleaning out to do to get at the old brattices; which work may readily cost as much as the brattice itself, thus making the cost of maintenance $2 per year, instead of $1.

Doors will cost:

Lumber, say 120 ft. b. m. @ $20, $2.40, nails $0.10	$2.50
Labor $3.75, hinges, $0.75	4.50
	$7.00

Door boys are thought more properly chargeable to haulage than ventilation, for even if there were no doors they would still be necessary, in the majority of places, to flag drivers ahead, and for this reason will not be considered.

There are, however, in most mines, at least one or two places where a door boy at $0.75 per day, or say $200 per year, could be replaced by an overcast at $50 first cost, good for 5 years, and thus costing only $10 per year, making a net saving of $190 per year for each door boy replaced.

The cost of the usual method of ventilation per year may then be figured:

Main, 90 old brattices, maintenance @ $1.00	$ 90.00
Main, 10 new brattices @ $4.50	45.00
Crosses, 160 old brattices, maintenance @ $1.00	160.00
Crosses, 50 new brattices @ $4.50	225.00
Doors, 5 new @ $7.00	35.00
Equivalent to 0.308c. per ton, for 180,000 tons, per year	$555.00

Where the old brattices have to be dug out before they can be replaced, this work may readily amount to $1 per year for each old brattice, or $90 additional. Where the mine workings are so arranged that the brattices on the cross entries will not be on service longer than the life of the first brattices put in, the $160 for maintenance may be dropped. It often occurs that shorter new lines are driven, but this is objectionable, as it leaves no suitable air current along the haulways to carry off the dust from haulage, the class of dust most to be dreaded.

In the example taken, where all the brattices have to be repaired at one time, the approximate cost will be:

Main, brattices, 90 old, replaced @ $4.50	$ 405.00
Crosses, brattices, 160 old, replaced @ $4.50	720.00
Equivalent to 0.625 c. per ton, for 180,000 tons	$1,125.00

Where the brattices have to be dug out the total cost may be $2250, or 1.25c. per ton, for a year's output.

Stone brattices are preferably from 1½ to 2½ ft. thick, depending upon thickness of coal, top, etc., and should be well hitched or cut into the rib, particularly in the case of soft coals that spall off readily. Where the coal is low and hard, with good roof and bottom, a 1-ft. wall would seem ample. The following table shows the contents in cubic yards of different sizes of brattices:

TABLE 1.

4 FT. COAL.

Width Crosscuts or Breakthroughs in Feet.	1 ft. Thick. cu. yd.	1.5 ft. Thick. cu. yd.	2 ft. Thick. cu. yd.
10.0	1.48	2.22	2.96
12.0	1.78	2.67	3.56
14.0	2.08	3.11	4.15
16.0	2.37	3.56	4.74
18.0	2.67	4.00	5.33
20.0	2.96	4.44	5.92
22.0	4.89	6.52	8.15
24.0	3.56	5.33	7.11

6 FT. COAL.

Width Crosscuts in Feet.	1 ft. Thick. cu. yd.	1.5 ft. Thick. cu. yd.	2 ft. Thick. cu. yd.
10.0	2.22	3.33	4.44
12.0	2.67	4.00	5.33
14.0	3.11	4.67	6.22
16.0	3.56	5.33	7.11
18.0	4.00	6.00	8.00
20.0	4.44	6.67	8.89
22.0	4.89	7.33	9.78
24.0	5.33	8.00	10.67

THE COST OF BUILDING BRATTICES

Where the draw slate forms a durable building stone, double-stone brattices, filled with muck, may be built for $10 to $15, part of the actual cost being properly chargeable to "slate," or entry cleaning. Where stone must be quarried and brought in from the outside, a good brattice, single thickness, may cost anywhere from $15 to $35. Where coke cinder is available, cinder concrete may be used for brattices and overcasts.

Disregarding the cross entries, which may be assumed to be the same in either case, and taking $25 as the cost of a stone brattice, which, particularly for low coal, may be considered a liberal estimate, the costs of wooden and stone brattices may be figured as follows:

Stone brattices:		
Main, 10 brattices @ $25.00 per year....		$250.00
Wood brattices:		
Main, 90 old brattices, maintenance @ $1.00.....	$90.00	
Main, 10 new brattices @ $4.50.	45.00	
		135.00
		$115.00

The balance of $115 in favor of wood brattices is equivalent to 0.064c. per ton, for 180,000 tons.

Figuring the cost of maintenance of wooden brattices at $2, instead of $1, the balance in favor of wood brattices is only $25, or equivalent to 0.014c. per ton for 180,000 tons.

Figuring stone brattices at $25, and the maintenance of wooden at $1, a stone brattice will need to be in service 25 years to be as cheap as a wood brattice; but figuring the maintenance at $2, will only need to be in service 12½ years.

Double wood brattices filled with muck may be figured at $10 to $11 each, with say $2 to $2.25 per year, for maintenance. Compared with this a stone brattice will only need to be in service 12½ years, or allowing $1 per year for digging, say 8 years, to be as cheap as a wooden brattice. Stone brattices cost somewhat more than the double air-course arrangement, where the latter does not involve shooting considerable top, or equivalent yardage for narrow work, but cost less where yardage must be paid.

Where the coal is so low that a small mule cannot be worked in the double air course, and the miners will not shore the cars, it is then necessary to shoot top, in order to have the crosscuts in the main-entry barrier pillar the proper distance apart.

TABLE 2. COST OF DOUBLE AIR COURSE WHERE TOP IS SHOT, IN CENTS PER TON, PER YEAR, PER ADVANCE OF MAIN ENTRY OF 900 FEET.

Thickness of Coal in Feet.	Price Per Yd. Shooting Top.	Advance of Main Entry Per Year = Yardage Double Air Course.	Total Yardage Cost Double Air Course.	Tonnage Per Year.	Cents Per Ton, Total Shipment.
3.00	$2.50	900 Ft.	$750.00	135,000	0.56
3.25	2.25	"	675.00	146,250	0.46
3.50	2.00	"	600.00	157,500	0.38
3.75	1.75	"	525.00	168,750	0.31
4.00	1.50	"	450.00	180,000	0.25
4.25	1.25	"	375.00	191,250	0.20
4.50	1.00	"	300.00	202,500	0.15
4.75	0.75	"	225.00	213,750	0.11
5.00	0.50	"	150.00	225,000	0.70

The last 200 or 250 ft. of the double air course, before it holes into the next crosscut, may be left unshot. This 250 ft. will about balance the extra top shooting in the crosscut, so that the yardage may be figured the same as on the entry.

While the disadvantage of unshot sections in one of the double air courses is fully understood, still in the case of a gob entry, the gob occupies a larger volume than the original top in place, and that thus reducing the ventilating cross section it is believed the unshot entry will offer less resistance than the airway shot.

Where the top is so bad that the double air course must be driven narrow, the additional narrow work in the crosscuts may be estimated at 200 ft. for each of three places, or 600 ft. for the entire 900 ft. of entry driven, depending upon the distance apart of crosscuts, thickness of barrier pillar, and angle on which crosscuts are driven.

YARDAGE COSTS

The accompanying tables, Nos. 2, 3 and 4, showing yardage costs, etc., have been calculated on the basis heretofore given, except that the yearly tonnage has been made proportional to the thickness of coal, on the basis of 180,000 tons for a 4-ft. seam, in order to avoid changing the rate of advance in proportion to the thickness, which would have been necessary had the yearly output been kept at 180,000 tons:

The yardage for narrow work, figured in cents per ton, is generally less in proportion, as the thickness of coal increases; so that, to a certain extent, the extra cost of the double air course may be said to keep within certain limits; but the rate of advance, in the example given, will usually correspond to a larger output per year in high coal than in low coal, so that the additional cost in cents per ton will be correspondingly reduced, while the general mining costs in high coal are also usually lower in proportion.

In low coal, where the double air course necessitates yardage as high as $2 per yard advance of entry, for either shooting top or narrow work, stone brattices are unquestionably cheaper; whether the double air course is worth the difference is a problem for each management to decide.

TABLE 3. COST OF DOUBLE AIR COURSE, EACH 14 FT. WIDE, FOR AN ADVANCE IN THE MAIN ENTRY OF 900 FT., WHICH REQUIRES THAT THE DOUBLE AIR COURSE SHALL BE DRIVEN 1100 FT., GIVING 3300 FT. OF YARDAGE.

Thickness of Coal in Feet.	Yardage Per Single Place.	Equivalent Yardage for 3 Places.	Cents Per Ton Double Air Course Coal Only.	Total Per Year.	Cents Per Ton Total Proportional Shipment.	Proportional Shipment in Tons Per Year.
3.5	$1.00	$3.00	18.37	$1,100	0.70	157,500
4.0	"	"	16.07	"	0.61	180,000
4.5	"	"	14.29	"	0.54	202,500
5.0	"	"	12.86	"	0.49	225,000
5.5	"	"	11.69	"	0.44	247,500
6.0	"	"	10.71	"	0.41	270,000
6.5	"	"	9.89	"	0.38	292,500
7.0	"	"	9.18	"	0.35	315,000
7.5	"	"	8.56	"	0.33	337,500
8.0	"	"	8.03	"	0.31	360,000

TABLE 4. APPROXIMATE CORRECTIONS FOR TABLE 3, SHOWING CENTS PER TON, FOR DIFFERENT YEARLY SHIPMENTS, AND FOR DIFFERENT TOTAL COSTS.

Thickness of Coal in Feet.	Total Yearly Shipments.	Total Yearly Costs. $1,000.00	$800.00	$600.00	$400.00	$200.00
3.5	157,500	0.64	0.51	0.38	0.25	0.13
4.0	180,000	0.56	0.44	0.33	0.22	0.11
4.5	202,500	0.49	0.39	0.30	0.20	0.10
5.0	225,000	0.44	0.36	0.27	0.18	0.09
5.5	247,500	0.40	0.32	0.24	0.16	0.08
6.0	270,000	0.37	0.30	0.22	0.15	0.07
6.5	292,500	0.34	0.27	0.21	0.14	0.07
7.0	315,000	0.32	0.25	0.19	0.13	0.06
7.5	337,500	0.30	0.24	0.18	0.12	0.06
8.0	360,000	0.28	0.22	0.17	0.11	0.06

In the case of big coal, particularly where the top is liable to fall from over the stone brattices, and thus at least partly wreck same, the total cost, including repairs, will run higher than the figures given, in proportion as the hight increases, while the cost of the double air course in cents per ton becomes less. Doubling the thickness may be said to double the output, and halve the cost.

Good air at the face of the main, however, does not necessarily mean good ventilation; as to doors compared with overcasts, there is the same objection to doors as to brattices every 60, 75 or 90 ft. along several miles of main entry. Doors are well enough where they can be kept shut, but their efficiency depends too much on the constant attention of a large number of employees, some of whom are certain to be negligent. It is not merely a question of smoke, but also of the resultant accumulations of dust.

Where the mine cars are in good repair, much of the dust resulting from haulage may be avoided by the simple and inexpensive expedient of filling the cracks between the boards with black strap.

Where the double air course does not involve yardage, the five overcasts likely to be needed per year, at $50 each, will require $250. Deducting from this, say $90 credit on the score of brattices, will make the total cost $160 per year, from which should be deducted the repairs to wrecked doors.

A large property is quite likely to require at least one relay fan inside, as the workings advance; while the relay fan is unquestionably a move in the right direction, still the leakage between the two fans may be sufficient to cause much of the fresh air from the outside fan to leak through the brattices, leaving the inside ventilator to merely churn the air without any beneficial result.

BRATTICE LEAKS

In the example taken, 100,000 cu.ft. of air per minute delivered at the working faces, and properly distributed, would seem ample; there are, however, 90 old and 10 new brattices, or 100 in all, so that it will only require an average leak of 1000 cu.ft. per minute per brattice to leave the remote faces without any ventilation whatever. If there are just two leaky cracks in every brattice, the cracks do not have to be large to cause a loss of one-third the air.

While both mud daubing and cement seem to act satisfactorily as a stopping for the cracks between the boards, neither one seems to answer quite as well for the joint between the boards and the coal, particularly if the coal has become smoked. Some form of calking, such as oakum, or mineral wool, after the brattice has become seasoned and the cement hardened, would seem preferable.

GENERAL CONCLUSION

Instances have been seen in which enough coal has been lost, owing to lack of any way of getting air to pillars, to pay for several years' narrow work or top shooting. The cost of the double air course is a distributed cost, and cannot become an accumulated back cost.

In the case of narrow work, even where the roof is bad, it is possible to drive merely the upper air course narrow, the lower air course and the break-throughs being driven wide, the break-throughs, however, being necked, thus reducing the cost to one-third; while the lower air course would doubtless be closed by falls, still the leakage from the brattices should be reduced, say to one-sixth. This arrangement of double air course driven in two sections will not delay the general rate of advance.

Where there are no yardage charges, for a large property, the ideal arrangement would be a quadruple air course near the fan, dropping off to a triple, and finally to a double air course, near the limits of the property.

A mine of such extent as to require years to work out, is always liable to have to go through an explosion; counting the delay, possible loss of orders, damage suits, etc., the cost may easily be $10,000 to $25,000, and in some instances much more; the entire cost of double air courses and overcasts is hardly 5 per cent. of $25,000, and in a sense, might be looked upon as a sort of premium paid on insurance. Not that these will by any means guarantee freedom from explosions, but the increased cost, where there is such, should be considered as partly offset by the lessened chances of an explosion.

It is not wished to leave the impression that it is thought that good work in the right direction has not, or is not, being done; there are, however, wide variations, and those mines that have been run, often for years, without any attention to ventilation, and without bad results, seem to prove in a practical sort of a way that is hard to get around, and often to the very man who some years later may be called upon to look after mines of considerable size, that more or less smoke does not make any difference anyway; and quite likely will result in the lack of that hearty coöperation which is necessary to the entire success of any plan.

Old mines that have been accumulating dust for years would seem to require more careful treatment than those that have always had good ventilation; dust that has once settled will not be carried out by the same quantity and velocity of air as that in suspension.

While honest efforts resulting in improved conditions should certainly be looked upon with satisfaction, still at the same time they should not be considered good enough, merely because better than heretofore, or adjacent mines, or than State laws require. The stand should rather be taken that the best that can be done is not good enough, if one may so express it; this will doubtless seem an extreme view to many, and unwarranted particularly in non-gaseous districts, yet on the other hand it would seem justified from the recurrence of explosions, often in up-to-date districts, some times without well explained or understood causes.

Owing to the unfortunate disaster that has just occurred in this district, it is necessary to state that I am only recently in the employ of the Pocahontas Consolidated Company, and have no connection with the Pocahontas division of the company. It might also be well to say that I have never been inside the Pocahontas mine where the disaster occurred, and no statements made by others in connection with this explosion have had any bearing on the above subject matter, which was practically complete at the time of the disaster referred to.

Anthracite in Russian Territory

Consul Alexander Heingartner, of Riga, reports that large deposits of anthracite coal have been discovered in the Russian territory of the Orenburg Cossacks.

The depth is only 56 in. and the vein extends about 133 miles north to south, and at about the same distance in a southerly direction from the great Siberian railroad. The great value of this discovery lies in the following facts:

(1) The proximity of the coal fields to the Ural iron and steel industry, which is at present mainly dependent upon wood and charcoal for fuel, and therefore otherwise incapable of a further expansion. (2) In view of the probable early exhaustion of the south Russian iron-ore mines, estimated to take place in about twenty to thirty years, the Ural district is destined to become the largest producer of iron and steel in the Russian Empire. (3) The discovery in the neighborhood of the coal fields of deposits of brown hematite.

Scarcity of Labor in Chile

Consul Alfred A. Winslow, of Valparaiso, reports that the labor question in Chile is becoming a very serious matter, and one that is keeping back the development of the country along all lines.

There is a great lack of laborers, both in the city and in the interior, and because of this workmen demand very high wages and are so independent that in many cases they are of little service. There are no labor organizations, but workmen are so scarce that anyone who wishes to work can demand and obtain almost any price. Common laborers have been paid 8 and 10 pesos per day, which means from $2.40 to $3 United States gold. The usual wage is from 5 to 6 pesos ($1.50 to $1.80) per day, and skilled labor in proportion. Even at these prices it is impossible to get enough men.

COLLIERY NOTES

Details in the Operation and Development of Anthracite and Bituminous Mines

As a general rule, mine superintendents prefer not to use a portland cement which begins to set in less than 30 min., or which sets hard in less than three hours.

In calculating brick work, it is well to remember that an ordinary brick will weigh 4½ lb. In a general manner, it may also be considered that 1 cu.ft. of common brick work will weigh 125 lb.

The addition of one or two per cent. of sulphate of lime to any Portland cement is sufficient to change the time of setting from a few minutes to several hours. When a cement has been made slow setting by the addition of sulphate of lime, it will become quick setting if mixed with a solution of carbonate of soda.

It is generally believed that the end of the pipe connecting to a water-gage gives the best results when it is placed at right angles to the air current. Some authorities advocate covering the end of the pipe loosely with a roll of felt, and inserting a wooden plug at the top; this causes the air to pass through the cloth, and enables the observer to secure better results.

In developing a mine, many engineers neglect to use proper care in turning off their cross entries. It is probable that eight out of every ten mine engineers will place their centers for driving the cross entry at right angles to the main haulway. This necessitates shaving the rib, and even then too sharp a curve is made for the trip to successfully travel. Most satisfactory results will be obtained if a specified curve with a 63-ft. radius is used in turning off each of these cross entries.

Experiment has shown that where coke is made in a bee-hive oven, and the smoke and gases given off during the burning pass from the oven into a main flue and are drawn under boilers to generate steam, the heat given off from these ovens will evaporate about 20 gal. of water per hour. The number of ovens necessary to feed one boiler is largely dependent on the quality of the coal and other local conditions; however, it may be generally taken that from 18 to 35 ovens will provide for one boiler.

Three-throw pumps have met with considerable favor and are now largely used in mine work. They consist of three ram pumps placed side by side on one bed and driven by connecting rods from three cranks, which are arranged on one shaft and set at an angle of 120 deg. with each other. Among the advantages claimed for this style of pump, it may be stated that the strain on the driving shaft is kept almost uniform, and the delivery of the water nearly constant. It is also possible to drive these pumps either by electricity or by wire rope.

As a general statement it may be said that 1 cu.yd. of rock, when broken, occupies 1.8 cu.yd. of space; also, 1 cu.yd. of earth, when broken, occupies 1.2 cu.yd. of space. Rock would therefore require 50 per cent. more loads to haul a given volume, measured in place, than the same amount of earth. At the present rate of pay it costs from 7 to 12c. to load 1 cu.yd. of rock into a cart. Similar experience has shown that the cost of loading earth into a cart varies from 5 to 7c. per cubic yard.

Blown-out shots are a source of great danger to coal miners, and numerous precautions should be observed to eliminate the possibility of such an accident. It is advisable, wherever possible, to see that the drill hole does not exceed the depth of under-cut. It is also best to have the hole pointed slightly upward, because all charges when fired have a tendency to rise, and a hole drilled in this matter will not require as much tamping. It is also advisable when shots are fired to have the room or entry in the vicinity thoroughly wet so that dry dust will not be raised and ignited.

It is sometimes impossible to investigate a coal seam by any other method than drilling. In such a case, the bore holes will accurately show the depth of the seam and furnish a core from which the quality of the coal may be determined. One difficulty, however, presents itself when such prospecting is carried on; this consists in finding the true thickness of the seam when the bed is inclined. The angle of dip must be first ascertained, and this often necessitates the drilling of several holes. When the pitch of the vein is known, the thickness is determined by multiplying the distance bored through by the cosine of the angle of dip.

In supporting the roof of an inclined seam, the props should neither be set vertically, nor at right angles to the dip of the vein; but rather at an angle slightly less than at right angles to the dip of the seam. This method is preferable because the tendency of the roof is to slide down hill, and if the prop is set as here suggested, the slipping of the roof will tend to drive the support into a line at right angles to the dip, which causes the timber to tighten and afford greater support.

In a mine where considerable timber is used, the economical gain resulting from the systematic drawing of props after the coal has been mined, not only results from the fact that such timber can be used again, but has the further advantage of causing the roof of the seam to settle more steadily and regularly on the gob. The practice of carelessly neglecting to withdraw timber may cause a sudden settling which sometimes results in a squeeze, or has some other disastrous effect.

There is a special art in sharpening and tempering miners' tools. In sharpening any piece of steel, the tool should not be heated to more than a blood color, and no further along its length than is absolutely necessary; it should then be hammered lightly and quickly until quite black. After this process of sharpening has been completed, the tool should be allowed to cool down before it is tempered. In hardening a pick or other similar instrument, the tool should not be heated farther up than 1 in. from the point, and should then be dipped into cold water for about ¾ in., leaving ¼ in. still at red heat. After filing the edges of the tool so the metal will be exposed to the atmosphere, the heat remaining in the top part gradually passes toward the edge, causing various colors to successively appear, varying from a faint yellow through brown and purple to a full blue color. If the article is plunged into water when the first color appears, the hardest temper will be secured; if it is plunged into water when the blue color appears, the metal will be softer and will permit a little bending before any fracture takes place.

In a mine or other operation where it is necessary to deposit concrete under water, there are many difficulties encountered in performing such work. Under no circumstances should the superintendent ever allow the concrete to fall through the water; even a drop of a few feet causes the material to rearrange itself and settle with the heaviest part, such as the gravel or broken stones, at the bottom. In lowering concrete through water, a V shaped box is often used; this apparatus is so built that by a lever or rope arrangement, one side of the box will swing loose and permit the concrete to deposit on the bottom. Another method, where the water is not too deep, is to have a long box or tube which is filled with concrete, then lowered in the water, and the bottom caused to open by means of a mechanical arrangement, allowing the concrete to gradually run out, while at the same time, a new supply is shoveled into the top of the tube. Other popular methods for building concrete in water is to place the mixture in paper bags which break and allow the material to run together; also cloth bags are used with much success, the cement oozing through the cloth and forming a solid mass.

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Illustrated.

The Santo Domingo Gold and Copper Company

It is unusual to hear of a promoter who publicly admits that he was mistaken as to an enterprise to which he had invited and accepted subscriptions; and on top of that offers to refund the money. Consequently the course of A. O. Brown & Co., a New York Stock Exchange house, in doing those things in connection with the Santo Domingo Gold and Copper Company, has received great applause, mingled with some astonishment. We should be the last to decry the merit of their action, but may be permitted to point out that they would have displayed a finer sense of honor by causing an adequate expert examination of the property to be made before they undertook its promotion.

The affair is a fine example of opera bouffe in mining. The promoters were gulled into the belief that several square miles of territory contained payable dirt, uniformly all over. No engineer was sent out to verify that idea. This was deemed unnecessary in view of the fact that Tom, Dick or Harry could dig at random and pan out the gold. The preliminary investigations were apparently of that character. After the company had been organized its sponsors smelled a rat and caused a competent investigation to be made, in consequence of which the directors decided to suspend development, and A. O. Brown & Co. sent out a circular letter to their subscribers of the purport stated above. Probably it was a job of "salting" that caused the mischief.

It is a pity that the honest promoting firm, even in its inexperience, cannot acquire the rudimentary precept that the time to employ an engineer is before, not after. We have no special admiration for the blunderer, who repairs, if he is able, the damage for which he is responsible. Even the clear-sightedness which avoids obvious blunders is no cause for admiration. In promotions of mines, or anything else, the highest moral obligation is fulfilled in making the most thorough investigation that common-sense requires before asking the public to come in. This is partly what the promoter's profit is supposed to stand for. The firm of A. O. Brown & Co. has learned this lesson at the cost of profound humiliation and doubtless of considerable money. But how many will profit from it? It was only last summer that the Fresno Copper Company was duped through the same failure to employ an engineer to advise before parting with its money, as was extensively commented upon in the JOURNAL. However, having failed to profit from that recent experience, not to speak of many previous ones, A. O. Brown & Co. certainly did the next best thing.

Coal Dust as a Factor in Mine Explosions

Although there has been a general discussion concerning the action of coal dust in many of the recent explosions, the investigations so far made have failed to give a clear understanding of this subject. That coal dust has been the main explosive force in many disasters is no longer doubted; nor do we now believe that gas must be present to propagate such an explosion.

The most difficult part of the coal-dust problem is to discover what elements must necessarily be present in a coal to make the dust dangerous. Some experiments have been carred on with this end in view, but the results obtained have not been particularly enlightening.

We know, of course, that a dust, to be dangerous, must be dry, finely powdered and present in a considerable quantity. Coal-dust explosions are more likely to occur in winter than in summer. This is due in part to the fact that the temperature in the mine is then higher than the outside temperature, and the mine air, when it enters the workings, becomes warmer, and, as a consequence, its capacity for holding moisture in suspension increases as the temperature rises. This causes the air currents to absorb the moisture found along the entries and dries the coal dust that is present.

A discouraging feature that has attended all investigations of coal dust is the inability to form any general fixed rules that can be relied upon to determine the characteristics that make a dust dangerous. It would naturally be supposed that the chemical composition of a coal would lead to a satisfactory solution; it has been found, however, that the composition of a coal will not determine its degree of inflammability or the extent to which it will aid an explosion.

Hard, compact coal will give less dust than crumbling friable coal, and as a result more dust will usually be found in a

mine where the coal is of the latter character. It is also sometimes stated that a coal must be high in fixed carbon to form a dust that will enter seriously into an explosion. This theory has not been generally proved, and according to the investigations so far made the results tend to show that in some instances a coal dust with a less carbon content has exploded more readily than where the coal was high in carbon.

The subject is of such importance that it deserves special attention from those who have the opportunity to carry on investigations. The fact that physical characteristics, rather than chemical composition, is the essential point, makes the problem rather uncertain and invites the serious attention of technical men.

Mining Stocks on the New York Stock Exchange

The movement to list mining stocks on the Produce Exchange has stimulated the New York Stock Exchange to action. We understand that a committee has been appointed by the latter, or will be appointed, to consider the creation of a mining department. Apparently being determined to forbid any relations between its members and other exchanges, and recognizing the extensive interests of its own members in the curb market, the leading exchange could hardly do less than make this tardy admission that good mining stocks are a meritorious class of security. The wonder is that it has not awakened to that fact long before this, especially inasmuch as it has had on its own list for a long time such stocks as Anaconda, Federal, Homestake and Ontario.

If the plan now under consideration is consummated, it will doubtless include these features: The submission of reports by reputable engineers as to the property for which application to list may be made; the right to make independent examinations by engineers of its own appointment; and the filing of quarterly financial reports and monthly reports of operations. If carried out on the above basis, which other exchanges like the Boston and the Produce would be sure to adopt, mining securities would increase greatly in the public estimation and the public would gain a powerful protection in learning to discriminate between the companies that could pass inspection, and those of a different class. Even the Amalgamated might under these circumstances be forced to change from the unlisted to the listed class.

The Price and Production of Copper

The reason for the present extraordinary price for copper is easily determined. The production of North America in 1906 was only 3.2 per cent. in excess of the production in 1905, while consumption increased at a considerably greater rate (just how much it is not yet possible to say), and at the beginning of 1906 the American market was bare of stock of refined metal, except the comparatively insignificant quantity that is always necessarily on hand.

The present outlook is for a prolonged continuance of the high level of price. Consumption shows no diminution, so far as can be judged from trade reports, and there is no great prospective increase in production. Arizona and Michigan both produced in 1906 to their full limit. Montana cannot do much more until the new smelting capacity, now under construction, is completed. Utah is troubled by the smelter-smoke question, and the new dressing works will hardly be completed before midsummer. The Balaklala, of California, will scarcely be producing before that time. Ely, Nev., will not begin to produce until 1908. Alaska will probably show a considerable increase in production, and Idaho will forge further ahead. At present there is no good ground for forecasting a larger percentage of increase in 1907 than there was in 1906.

In 1908, when the disseminated ores of Bingham, Utah, and Ely, Nev., will be yielding copper, when Shasta county, Cal., will be producing at its maximum, when the smelting capacity on the Pacific coast will be greatly increased and larger supplies of ore will be coming from Alaska, we may expect an important gain in the production; but who can say what the consumption will be then?

We believe that during the next ten years the copper of Alaska is going to be a great factor in the production. The reports of reliable engineers on its deposits, with which we are conversant, are strongly optimistic. According to the statistics which we published Jan. 5, the production of Alaska increased from 4,703,600 lb. in 1905 to 6,250,000 lb. in 1906. However, the latter figure did not give the Territory its full credit, inasmuch as much of its ore goes to Vancouver Island smelters and appears in the Canadian production. Making allowance for that, the production of Alaska in 1906 was about 8,000,000 lb.

Dr. Charles D. Walcott

Dr. Charles D. Walcott, director of the United States Geological Survey since 1894, was chosen secretary of the Smithsonian Institution on Jan. 23, at the annual meeting of the regents. The election of Professor Osborn to the position was announced some time ago, but he was unable to accept it. Dr. Walcott has had charge of the Geological Survey for some twelve years, and leaves it in excellent condition. During his term the work of the Survey has been greatly extended by the addition of the irrigation and water investigations, but it has met the increase promptly and creditably. His administration has been thoroughly successful from the beginning.

In Connection with the smelter smoke problem, it is interesting to note that the Steptoe Valley Smelting and Mining Company, which is now building an immense plant at McGill, Nevada, 14 miles from Ely, to smelt the ore from the latter camp, has acquired eight square miles of territory, together with the water right of the entire section, the object of securing this large area being to prevent the possibility of any damage claims arising from a smoke nuisance or the pollution of water. This certainly is a wise plan, especially where land can be secured so cheaply as in that section of Nevada. The Steptoe Valley company is jointly owned by the Cumberland-Ely and Nevada Consolidated companies.

All of the readers of the Journal will congratulate Lewis E. Aubury upon his reappointment as State mineralogist of California. He was originally appointed for the term of four years in 1901, but has held over nearly two years. He has now been named to serve the remainder of the unexpired term. Under Mr. Aubury's administration the excellent State mining bureau of California has been made an active and useful agent in promoting the best interests of the mining industry of that State to a greater extent than ever before. It is pleasant to know that he will be able to continue the good work which he has inaugurated.

THE PRODUCTION OF COPPER IN ARIZONA DURING 1906

Operations in the Various Districts—Output of the Chief Producers

BY JAMES DOUGLAS

The production of Arizona during 1906 has, if anything, exceeded anticipation. The increase has been attributable to legitimate expansion of operations, rather than to illegitimate pressure upon the mines to meet the extraordinary demand for copper. The surplus has come mainly from the Warren district, and from miscellaneous sources. The Copper Queen mine production, treated at the large Douglas smelter, or shipped to Globe as sulphur ores to aid in matting the oxidized ores of the Globe district, exceeded last year's production by approximately 18,000,000 lb. The production of the Calumet & Arizona smelter was also approximately 12,000,000 lb. in excess of that of 1905. This excess was contributed in part by other mines than the Calumet & Arizona, controlled by the same group of owners, and which became active producers during last year. Their output—with that of still other mines of the same group—will during the coming year contribute to increase the output of the Bonanza properties. While the Copper Queen mine may not increase its own production during the coming year, not only will the Calumet & Arizona group yield more copper, but some other companies in the district will enter the active list, and continue to make the Warren district lead during 1907, as it has done during 1906, though probably not quite to the same extent.

The Clifton district would during the past year have exceeded its actual production had it not been for the serious floods in early December which disabled all the works in the district for a time. As it is, however, the district produced about 5,000,000 lb. more of copper than it did in 1905. The United Verde likewise increased its production, and the Globe smelter has turned out 8,500,000 lb. of copper in excess of the previous year. Of the Globe output about 12,000,000 lb. was from Mexican ores or mattes, secured primarily for their sulphur contents. The quantity of sulphur, however, derived from the ores of the Globe district is increasing so rapidly that the prospects are that within a twelvemonth Globe will be independent of imports for its supply. One of the large veins under the Buffalo hill has recently been struck, in drifting from the Gray shaft of the United Globe mines, which contains besides copper and sulphur a notable amount of the precious metals. The Continental group of the Old Dominion Company is producing more copper and sulphur than was anticipated, and the lower levels of the Old Dominion mine likewise are also producing sulphur ores in such quantity as to warrant the prediction that, with ore coming from the Arizona Commercial and other local mines, the coming year will relieve the district of the necessity of looking to foreign sources for any ingredients of its furnace mixture.

In addition to these old standard sources of supply the Helvetia Company has been producing; the old San Carlos Copper Company, now reorganized as the Saddle Mountain Mining Company, has been running intermittently and producing a considerable amount of matte, and the smaller mines of Yavapai county, stimulated by the facilities offered by the Humbolt smelter, have yielded more copper than the county ever before supplied from these secondary sources.

Adding together the increased production from the old and these contributions from new mines, the territory has helped to meet the excessive demand of the world for copper by increasing her output from 223,000,000 lb., in 1905, to approximately 265,000,000 lb. in 1906.

The furnace capacity of the Southwest has undergone increase during the past year, and plans are suggested for further augmentation during the coming year. The Copper Queen smelter at the present time consists of ten furnaces, and an increase is contemplated of one additional furnace 54 ft. long. The Calumet & Arizona smelter, it is understood, intends adding two new furnaces to its present plant of five, and the Old Dominion has or will add two additional furnaces. The Detroit Copper Company is remodeling its converting plant. The new concentrator of the Arizona Copper Company was put into commission in July last, and the Detroit Copper Company's enlarged concentrator has been in full operation for several months. The Saddle Mountain Mining Company, as already stated, has become an independent producer, but the most important addition to the metallurgical equipment of the territory is the new Humbolt smelter on the Agua Fria, provided with both reverberatory and cupola furnaces.

A reverberatory furnace has been running steadily at the Detroit Copper Company's works, at Morenci, receiving the slag continuously from the cupola settler and melting the flue-dust. The results have been, from both a technical and an economical point of view, very satisfactory, reducing the copper in the slags approximately one-tenth of one per cent., while the total cost of operations has been somewhat less than would have been the cost of briquetting and smelting the 6000 tons of flue dust which have been treated. The fuel employed has been crude oil, and the experiments have been directed to the best method of adding the flue dust to the stream of liquid slag as it enters the furnace from the settlers. If inserted by the barrow or carload, though it is rapidly melted down, it creates a superficial layer of slag, which, though liquid enough to flow, is more silicious and higher in copper than the lower strata, with which it can be mixed only by violent agitation. The method involving least labor and the most perfect mixture is by allowing a stream of flue dust to strike the jet of incandescent gas; but the corrosive effect on the roof of the furnace of the dust thus created increases the cost of repairs. Experiments looking to the treatment of fine concentrates by throwing them upon this bed of liquid slag indicate that a very rapid process of liquation proceeds, the sulphides in the concentrates melting immediately, and desending through the liquid slag, leaving infusible silicious shells upon the surface which tend to form accretions on the walls of the furnace, as well as a stratum of highly silicious slag. Where, however, it is desirable to save the sulphur contents of the concentrates, no better method could probably be adopted of reducing to a minimum by volatilization the sulphur contents, while making a low-grade matte for subsequent treatment in the cupola. The percentage of costs chargeable to reversibility during the year has been as follows:

	Per Cent.
Fuel oil	73.11
Labor	17.35
Repairs	8.85
Shop expense	.42
Water	.21
Light	.16
	100.00

The furnace is 50 ft. long; the heat of the gases in the combustion chamber is 1400 deg. F., and at the flue end 1210 deg. F. A boiler to generate steam is being erected, and the economy which will result from the utilization of the escaping gases has therefore not yet been determined, but will notably decrease the cost of furnace treatment.

No radical changes have been made in mining. The Arizona Copper Company has introduced underground electrical traction, and the Copper Queen is planning to concentrate all its ores at the new Sacramento shaft, to use a skip, and then by a belt conveyer to distribute to a train of cars the ores from every section of the mine, thereby securing a more perfect smelting mixture than is now obtained. But at the Cananea

mine the caving system so successfully used in the lake iron mines has been adopted.

The mining and smelting operations during the latter months of the year have had to struggle with the same conditions that have beset nearly all the industries of the country—scarcity of fuel, scarcity of labor, and frightful congestion on all the railroads serving the territory. The cessation of the fuel-oil supply from both Texas and California necessitated a sudden return to coal, and strained the only accessible coalfields to the utmost in meeting the exigency. The increased demand nearer home for Colorado and other Western cokes has obliged the smelters of the Southwest to rely largely for their coke supply on Eastern sources, which, under existing railroad conditions, were only able to forward it with precarious uncertainty. But all the interests, appreciating the adverse conditions arising from excessive prosperity, have borne with commendable patience and resignation the slight evils to which they have been exposed in consideration of the benefits which prevailing high price of their product has conferred.

The Tin Market in 1906

More than ever before in its history, tin was used as a football by speculators in the London market, as well as in New York, during 1906. It was comparatively easy to create a bull or bear position as the available supplies were closely concentrated in a few hands. As the production, at least so far as the East Indies were concerned, did not increase, while the consumption showed remarkable expansion, no stocks of consequence were accumulated during any part of the year. This fact assisted materially in making manipulations of the article at the different exchanges an easy one. The consequence was an excited and exaggeratedly high market when the bulls had the upper hand, and a rapid decline in prices when the bears were victorious.

On going in detail into the market situations as the year developed them, we find that at the beginning of 1906 spot tin was selling at 36c. per lb. It fluctuated between this and 37c. per lb. until toward the end of March, following closely quotations received from London. In April a shortage of spot supplies became acute and a corner instituted in the same proved so effective that toward the middle of May owners of small available stocks were able to drive prices up to 48c. and 50c. per lb. During that time a large quantity of Chinese tin was brought into this market and consumers who had never before dared to use anything but prime Straits or Malacca tin were only too glad to have an opportunity to replenish their supplies by acquiring some of this lower-grade Chinese tin.

Fortunately, this corner did not last very long, but was followed during the last week of May by a slump which brought prices down by about £30@35 in London and from 6@8c. in this market. The market held steady at this level during the month of June and the beginning of July, at which time spot tin was selling for from 39@39¼c. per lb. July again witnessed a rather bad break in London and simultaneously in this market prices touched 36c. Prices righted themselves during the month of August and retained a level of 40½@41½c. per lb. until the end of September. During October the bull party in the London market had everything its own way and prices held around 43@43½c. When, notwithstanding the firm and high market, large orders from American consumers failed to materialize, and it was even found that one of the largest consumers of tin in this country was re-selling some of its purchases in the London market, the influence on that market was rather depressing. Prices settled gradually into a lower level and closed the end of the year at 42c.

Developments in the different producing centers of tin during 1906 showed that no increase need be expected in the Straits Settlements. While some of the mines there are petering out entirely, a great many others are running on leaner ore and prospecting work in new directions is not being done by the Chinese. Production in the Dutch colonies is continuing at the regular rate. There should be a large increase in the output of Bolivian tin, and as soon as the necessary railroads have been built in that country an increased tonnage ought to be available for export. The high prices for tin have also had a stimulating effect on tin mining in Wales and also in some parts of Saxony, Germany, where, however, the production at best is not large.

So long as the output of this important metal is, comparatively speaking, limited and handled to a large extent through London brokers, the disturbing element of wild speculation cannot be eliminated.

Ores of the Cripple Creek District

The characteristic feature of Cripple Creek ores is the occurrence of the gold in combination with tellurium and chiefly as calaverite. This peculiarity is pointed out by Messrs. Lindgren and Ransome in their report on the Cripple Creek district which the United States Geological Survey has published recently as Professional Paper No. 54, "Geology and Gold Deposits of the Cripple Creek District, Colo."

Native gold is present at Cripple Creek in the unoxidized ores only as a rarity. Pyrite is widely distributed in the country rock and also occurs in the veins with tellurides. Galena, sphalerite, tetrahedrite, stibnite, and molybdenite are sparingly present. Among the gangue minerals quartz, fluorite, and dolomite prevail; celestite is also often present, but is frequently changed into quartz. The ore occurs chiefly as filling of narrow fissures and consequently the ores as mined have the approximate composition of the country rock. The average tenor of gold in the ores is about $30, or 1.5 oz. per ton, and at various mines ranges from 1 oz. up to 3 or 4 oz. Ore with less than $12 per ton is rarely mined. Small amounts of ore with up to 2500 oz. of gold per ton have been mined. The pyrite is rarely auriferous except when admixed with tellurides. The ores contain on an average only about 1 oz. of silver to 10 oz. of gold. In some mines the proportion is very much less. Small shipments have been made of tetrahedrite ore rich in silver.

The tenor of the ore as mined has decreased somewhat in the last 10 years, but this is probably mostly due to lowered operating and reduction expenses.

A Great Smelter Stack

SPECIAL CORRESPONDENCE

The Boston & Montana Mining Company has let a contract for the erection of a stack at its smelter, 506 ft. high, 500 of which will be above ground. The Alphonse Custodis Chimney Construction Company, of New York, will do the work, and must finish it by Nov. 1 of this year. The cost will be about $200,000. The stack will be circular in cross section, and will have an inside diameter of 50 ft. at the top and 75 ft. outside diameter at the bottom. Its weight will be 16,600 tons. It will be made of perforated brick, which will be manufactured on the ground and designed to fit the curvature of the circle. The stack at the great Washoe plant is only 300 ft. high and 2,200,000 common brick were used in its construction. If this class were used in the new chimney, 5,700,000 would be required. The top of the stack will be 742 ft. above the blast-furnace charging floor, and 320 ft. above the top of the present stack. A flue 1800 ft. long will connect the furnaces and stack, 1450 ft. of which will be 48 ft. wide and 20 ft. high, while about 350 ft. will be 175 ft. wide and 20 ft. high. The latter section will be the dust chamber. The stack will have 2¾ times the capacity of the Washoe chimney. The object in making it so large is to be prepared for any increases that may hereafter be made in the capacity of the smelter, which was designed originally for 1000 tons a day, but is now treating 3000 with another addition of 1000 tons authorized.

A syndicate is in course of formation with the object of continuing operations in connection with a discovery of petroleum in the district of Hope Town, Cape Colony.

New Publications

"Mines of the Transvaal." By R. R. Mabson. Fourth Edition (1906-7). Pp. 776, with maps and plans. 5x8 in.; cloth, $6. London, 1906: *"The Statist."*

"Geological Survey of Canada, Section of Mines; Annual Report, 1904." Elfric Drew Ingall, Chief of Section. Pp. 162. 6½x10 in.; paper. Ottawa, Canada; Public Printer.

"Thirty-first Annual Report of the Chief Inspector of Mines of the State of Ohio; for the year 1905. George Harrison, Chief Inspector of Mines. Pp. 440, 6x9 in.; paper. Columbus, O.; State Printers.

"Geographical Dictionary of Alaska." Second edition, 1906. By Marcus Baker. Being Bulletin 299, United States Geological Survey. Pp. 688, 6x9 in.; paper. Washington; Government Printing Office.

"The Area of the United States, the States and the Territories." By Henry Gannett. U. S. Geological Survey, Bulletin No. 302. Pp. 9 and 1 map. 6x9 in.; paper. Washington, 1906: Government Printing Office.

"Report of the Mine Inspector for Indian Territory to the Secretary of the Interior for the Year Ended June 30, 1906." By William Cameron. Pp. 58. 5½x9 in.; paper. Washington, 1906: Government Printing Office.

"Report of the Chief Inspector of Mines in India, Under the Indian Mines Act (VIII. of 1901) for the Year Ending Dec. 31, 1905." By W. H. Pickering, Chief Inspector of Mines. Pp. 67. 8½x13 in.; board covers, 12 annas or 1s. 2d. Calcutta, 1906: Office of the Superintendent of Government Printing.

"Third Report on the Geological Features and Mineral Resources of the Pilbara Goldfield, Western Australia." By A. Gibb Maitland, Government Geologist. Western Australia Geological Survey, Bulletin No. 23. Pp. 92, with 7 geological maps and 13 figures. 5½x8½ in.; paper. Perth, 1906: Fred W. Simpson, Government Printer.

"Combustion and Smokeless Furnaces." By Jos. W. Hays. Pp. 104; illustrated. 6x9 in.; cloth, $1.50. New York, 1906: Hill Publishing Co.

Contents: Heat and combustion. Combustion and boiler furnace. Combustion and steam boiler. The chimney evil. Smokeless furnaces in general. Mechanical stokers. Hand-fired furnaces. Some conclusions.

"Hints to Practical Users of Tool Steel." By Arthur Balfour. Pp. 60. 4½ x7 in.; paper; Sheffield, England; Seebohm & Dieckstahl, Ltd. New York and Chicago; George Nash & Co.

Though issued in the interest of a steel firm, this little book is more than a trade catalog. It contains practical rules and directions for the working and use of tool steel, which ought to be of service to toolmakers and others, including users of drills.

"Mortars, Plasters, Stuccos, Artificial Marbles, Concretes, Portland Cements and Compositions." By Fred T. Hodgson. Pp. 520; illustrated. 5x7½ in.; cloth. Chicago: Frederick J. Drake & Co. Price, $2.

The title of this book is comprehensive enough to indicate its contents. It is a compilation intended as a hand-book on the use of plasters and cements in building of all kinds. After a general treatise on cement materials and the composition of the various plasters and concretes, it treats of their uses and the methods employed with them in building and decoration. A great deal of space is given to concrete, and its various uses, and to reinforced concrete construction. It is condensed, but comprehensive, and is intended for the use of practical men, who will find it of much service in their work.

"Mining and Engineering and Miners' Guide." By Henry A. Gordon. Pp. 615; illustrated. 6x9½ in.; cloth; 10s. Wellington. N. Z., 1906: John Mackay, Government printer. London: Eyre & Spottiswood.

This work, which was originally published as the "Miner's Guide," has proved so useful that it has been expanded into a general treatise on mining engineering, especially in connection with gold mining, lode and placer. The author was formerly inspecting engineer of the Mines Department of New Zealand, and is a past-president of the Australasian Institute of Mining Engineers. Everyone who is familiar with the excellent "Miners' Guide" will be glad to have the present work. The fact that it is the third edition manifests the general appreciation that it has met with. Many new chapters have been added and the old ones have been considerably amplified. American engineers will find much that is of service in this work, which has achieved such great popularity in Australia and New Zealand, where it is best known.

"Producer Gas." By J. Emerson Dowson and A. T. Larter. Pp. 295; illustrated. 6x8½ in.; cloth, $3. New York, 1906: Longmans, Green & Co.

Contents. Theory of producer gas. Furnace work. Heating work. Engine work. Suction plants. Gas from bituminous coal for engine work. Stand-by losses. Comparison of gas and steam power. Fuel. Analysis of fuel and of producer gas. Calorific power of solid and gaseous fuels. Practical notes. Appendices.

Dowson is one of the famous names in the history of gas-firing, and consequently this book will be heartily welcomed. The joint authorship gives it a certain peculiarity of appearance. The preface is signed by Mr. Dowson alone, and in it he states that he could not have undertaken the preparation of the book without the help of his assistant, Mr. Larter. In the text the first person singular, first person plural, and the third person "Mr. Dowson" are severally used. However, this is an immaterial matter.

The book is distinctly the treatise of an engineer, rather than of the pedagogue, and therein differs from much of the work in the literature of gas-firing. Yet for that very reason it has certain disappointments, especially because it fails to go into the question of costs, as is the case with all the other works on this subject that we know. The great economy of gas-firing in respect to coal consumption is well known, but as in the comparison between the steam engine and the gas engine, that is only part of the story. The comparison to be complete must start with the first cost of plant and must include operating costs other than fuel consumption. Everyone is well aware that there are conditions wherein it is more profitable to waste coal than to install gas-fired regenerative furnaces, in spite of the great fuel economy of the latter. An exhaustive analysis of that phase of the subject remains to be presented.

However, there are many furnaces in connection with which gas-firing and the principles of heat recuperation can be applied at only a small increase in first cost and with unquestionably great advantage. Mr. Dowson's descriptions of some of these are particularly useful. We regret that he did not see fit to go further into the details respecting them. In this connection we read with some surprise that the system of counter-current recuperation, originally introduced by Gaillard and Haillot is followed in nearly all modern recuperative gas-heated furnaces. Mr. Dowson remarks: "This not only simplifies the working of the furnace and materially reduces the risk of explosions, but lessens also the cost of construction and the ground space required." We agree with the first part of this, but should qualify the latter part. Moreover, we should add that, at its best, counter-current recuperation is not quite so efficient as reversing in respect to utilization of heat units, and it involves serious structural difficulties in keeping the joints of the flues tight under the severe expansive conditions of a high-temperature furnace.

But it is not our purpose to be captious. We consider the present work to be one of the most practically useful in its subject of any heretofore published, and have pleasure in recommending it to the attention of engineers and metallurgists. It goes extensively into the use of producer gas in internal-combustion engines, which indeed occupies a large part of the book. The printing of the latter is good, but the engraving might have been better. A good index concludes this valuable addition to engineering literature.

CORRESPONDENCE

Discussions by Our Readers of Various Topics of Interest

The Carmichael-Bradford Process

Referring to your editorial in a recent issue, and to the letter from R. Anstee, I take it that, though he does not explicitly say so, Mr. Anstee intends to refer to the "direct decomposition of the gypsum" (or rather of the anhydrous $CaSO_4$ which has resulted from it) by the silica and silicates present in the charge. It has seemed to me also that in your editorial you had missed, or at all events had failed to emphasize this point.

In discussing the reactions and final results of the three processes in the "lime roasting of galena," it is necessary to keep in view the cardinal point that none of them can obtain the desired final product without the presence of a certain amount of silica in the charge. Whatever may be the course of the reactions during the earlier roasting periods of the processes, the final stage consists in the more or less complete slagging of the materials with the decomposition of sulphate brought about by the formation of silicates. During this stage calcium sulphate undergoes this decomposition equally with lead sulphate, giving its share of sulphur dioxide to the gases, and this has nothing whatever to do with any reactions which may or may not have occurred earlier between PbS and $CaSO_4$.

The Huntington-Heberlein process in the preliminary separate calcination produces $CaSO_4$ by means of part of the sulphur in the ore, another part of the sulphur passing away in the calciner gases. When the calcined charge comes into the converters there is thus, of course, less sulphur present than there was in the original ore. In the Carmichael process the $CaSO_4$ is added ready-made, and there is also no loss of sulphur from the ore due to preliminary calcination; so that all the original sulphur, plus all the sulphur of the gypsum used, will be theoretically available in the converter gases for the making of sulphuric acid, and hence the great advantage of this process wherever gypsum is economically available, in addition to the economy in original outlay on plant and in costs of preliminary calcination.

Regarding the discussion of the reactions which may take place in roasting (without fusion) when PbS and $PbSO_4$ are together, it seems to be quite certain that no decomposition of $CaSO_4$ alone takes place at any temperature with which these processes are concerned in practice. Also we know that $CaSO_4$ is easily reduced to CaS when heated even to a moderate temperature in contact with any carbonaceous material; and that CaS again is very easily and rapidly oxidized to $CaSO_4$ at a low temperature.

My own view is that when $CaSO_4$ and a sulphide mineral, say PbS, are heated together, the sulphide acts on the $CaSO_4$ at the point of contact in a manner similar to that of the action of the carbonaceous material, giving oxidation of the PbS, with local reduction of the $CaSO_4$ to CaS. In a current of air the CaS is re-oxidized, and this reduction and re-oxidation goes on continuously. Call this action catalytic or what you will, the result is that galena so treated oxidizes far more rapidly and at a lower temperature than when treated alone.

It is quite true that ferric oxide has the same action, but it is not so vigorous. In roasting rich, fine-grained galenas in long calciners I have found the use of a certain proportion of Fe_2O_3 so advantageous that in the treatment of many thousands of tons "blue billy" was purchased for the purpose and well repaid the cost; and I expect that many other metallurgists have had the same experience.

W. MAYNARD HUTCHINGS.

Newcastle-on-Tyne, Dec. 12, 1906.

Estimation of Zinc in Ores Containing Iron

The method for the estimation of zinc in ores containing iron described by your correspondent is 17 years old and has been used by the chemists of the Broken Hill Proprietary Company, Australia, for more than 10 years, as I know from experience. It seems odd that it should not be widely known in this country.

It is a good method for rapid work, but for buying and selling zinc ore it requires to be checked by the Schulz & Low method, using auranium salt as indicator.

It may interest your correspondent to know that the originator of the method was Voight, who described it in the *Zeitschrift fuer Angewandte Chemie*, year 1889, pages 307-308. It is also in Sutton's "Volumetric Analysis," not only in the new editions, but in the 1890 edition, in which it is given as follows:

"The solution of the substance in hydrochloric acid is oxidized with nitric acid and diluted to about 100 c.c. Sufficient potassic tartrate to keep the iron in solution is added and then ammonia *to feeble alkalinity*, and the liquid is further diluted to about 250 c.c. Standard solution of potassium ferrocyanide is then run in until a drop of the mixture brought into contact with strong acetic acid develops a permanent blue. The ferrocyanide is of suitable strength if 1 c.c. is equal to 0.01 gram of zinc. About 46 grams of the salt are dissolved and made up to 1 liter and the solution is standardized against one of zinc made by dissolving 12.461 grams of zinc oxide in hydrochloric acid and diluting in 1 liter. Ten c.c. of this solution mixed with 5 grams of potassic tartrate, a few drops of ferric chloride, ammonia and water to 250 c.c. should require 10 c.c. of the ferrocyanide. An essential condition is that the excess of ammonia should be as small as possible."

HENRY WATSON.

Chicago, Jan. 9, 1907.

Tapping Water in Mines

The spirit of coöperation manifested in the article, "Tapping Water in a Mine," in your issue of Oct. 13, 1906, is to be commended. The man in charge was confronted with the risk of property loss and perhaps also of life. He frankly admitted that he desired the opinion of others. Such cases are rare and are apt to be dangerous because of errors in surveying or in working after surveying. To avoid these risks no company should be allowed to abandon any mine in which much development work has been done, without surveying and recording the last work done, and correcting all maps, etc. In tunnels passing under rivers, in hard ground, test holes should be kept ahead of the workings in order to prevent such disasters as we have heard of in holing into abandoned mines.

Two experiences of mine with cases of this kind may be of interest to someone who may be unfortunate enough to encounter similar difficulties. We had a shaft down 400 ft. at an angle of 70 deg., and from this we ran a drift on the vein 375 ft. Above was a shaft on a hill 240 ft. deep, and to connect with the drift we had to drive a crosscut 70 ft. into the hanging wall, then sink for a sump, and then to raise up to strike the shaft and unwater the old workings. It seemed risky and I had forebodings enough, especially after getting letters from the company admonishing me to be careful and to take no chances.

In order to perform the operation safely I built a bulkhead, first making a wall of

brick midway in the crosscut, and then strengthening by means of a wall of concrete. A 4-in. pipe and valve were placed in the bottom to release the water in such quantities as the pumps below could dispose of.

When the raise was up to the desired hight, a dozen holes of different lengths, varying from 5 to 11 ft., were drilled and loaded, and the bulkhead was securely closed. The valve was shut off and everything put in readiness to press the battery. The only thing I feared was the concussion of the blast, which I thought might injure the bulkhead, drown our pump and fill the mine to an unknown depth. I knew that would be the result if we failed to knock through. Why did we not drill through and tap it that way? Because the character of the rock did not warrant that course.

The foreman left me to set off the blast. There were exciting minutes before a muffled sound announced success, to my great relief. Everything held intact, and I received the congratulations of my superiors. We drained the working above without any mishap whatever.

My other experience was not of so exciting a character. It was not unlike the case mentioned in your paper. I merely took what was near at hand, an 8-in. pipe (a 6-in. would have been quite as satisfactory), and attached flanges, a gate valve, and a clack of the ordinary form on the inside of pipe. The outer end was reduced by means of reducers to nearly the size of a drill rod. Inside of the pipe, between the clack and the reducer, we placed a mass of waste, so that if we were caught with the drill in the hole, it would act as packing. If we had time to withdraw the drill, we would plug up the reducer and let the clack act. This plan can be rigged so as to withstand any pressure.

T. S.

Patents Relating to Mining and Metallurgy

UNITED STATES

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by the ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to name the issue of the JOURNAL in which the notice of the patent appeared.

Published Week Ended Dec. 25, 1906.

CRUSHING-MACHINE—Morton G. Bunnell, Chicago, Ill., asignor to Western Wheeled Scraper Co., Aurora, Ill. Continuation of application filed March 23, 1900. No. 839,103. This application filed Oct. 24, 1906.

PROCESS OF SMELTING IRON ORES—Carleton Ellis, White Plains, N. Y. No. 839,126. Filed Dec. 26, 1905.

ZINC-SMELTING FURNACE—William Lanyon, Iola, Kans. No. 839,160. Filed July 31, 1906.

APPARATUS FOR IGNITING PRIMERS IN WELLS—Francis I. Du Pont, Wilmington, Del., assignor to The E. I. du Pont de Nemours Powder Company, Wilmington, Del. No. 839,194. Filed Nov. 8, 1906.

GRINDING-MILL—John C. Woodcock. Chillicothe, Ohio. No. 839,248. Filed June 11, 1904. Renewed Sept. 19, 1906.

APPARATUS FOR SEPARATING METALS FROM ORES—William Snee, West Elizabeth, Pa., assignor to John A. Snee, West Elizabeth, Pa. No. 839,329. Filed Apr. 3, 1906.

APPARATUS FOR DRYING AIR FOR METALLURGICAL PURPOSES—Giuseppe Cattaneo, Charlottenburg, and Julius Schlesinger, Berlin, Germany. No. 839,362. Filed Jan. 9, 1905.

GRAVITY-SEPARATOR—William Hughes and James Thomas, Ravenrun, Pa. No. 839,387. Filed Dec. 5, 1905.

THEODOLITE—Peter J. J. B. Sorensen and Alfred C. B. Sorensen, Green Bay, Wis. No. 839,433. Filed Mar. 20, 1906.

TREATMENT OF PYRITIC ORES—William Blackmore and Alfred Howard. London, England, assignors to the T. R. Refractory Ore Syndicate, Ltd. London, England. No. 839,451. Filed Mar 27, 1906.

PROCESS OF MAKING GAS—Hugo Dicke, Frankfort-on-the-Main, Germany, assignor to Jacob Eduard Goldschmid, Frankfort-on-the-Main, Germany. No. 839,459. Filed Sept. 27, 1901.

APPARATUS FOR WASHING BARYTES—William R. Macklind, Mineral Point, Mo. No. 839,493. Filed Sept. 8, 1906.

FURNACE—Martin V. B. Smith, New York, N. Y. No. 839,520. Filed Feb. 28, 1906.

IODINE PREPARATION—Emil Fischer, Berlin, Germany, assignor to Farbenfabriken of Elberfeld Co., New York, N. Y. No. 839,569. Filed Dec. 16, 1905.

ROCK-DRILL—Henry Hellman and Lewis C. Bayles, Johannesburg, Transvaal. No. 839,586. Filed May 31, 1904.

Published Week Ended Jan. 1, 1907.

ELECTROCHEMICAL APPARATUS—Frank A. Decker, Philadelphia, Pa., assignor, by mesne assignments, to Decker Electrical Manufacturing Company, Wilmington, Del. No. 839,816. Filed Mar. 9, 1905.

MAGNESIA-CEMENT COMPOSITION—William L. Dudley, Nashville, Tenn. No. 839,820. Filed Aug. 17, 1906.

DRILL—George E. Eaton, Corning, N. Y. No. 839,824. Filed May 23, 1906.

DRILL-BIT FOR WELLS—Charles W. Guttzeit, High Bridge, N. J., assignor to Taylor Iron & Steel Company, High Bridge, N. J. No. 839,837. Filed Apr. 2, 1906.

AUTOMATIC DUMPING AND RIGHTING HOISTING-BUCKET—Walter T. Krausch, La Grange, Ill. No. 839,858. Filed Feb. 26, 1906.

INGOT-CASTING MACHINE—Nils H. O. Lilienberg, Philadelphia, Pa., assignor of one-half to Bradley Stoughton, New Haven, Conn. No. 839,861. Filed Mar. 14.

DUMPING-CAR—Alvin C. McCord, Chicago, Ill, No. 839,870. Filed Sept. 1, 1904.

GYRATORY CRUSHER—Jay B. Rhodes, Chicago, Ill., assignor to Austin Manufacturing Company, Chicago, Ill. No. 839,891. Filed Mar. 11, 1905.

GYRATORY CRUSHER—William A. Spring, Harvey, Ill., assignor to Austin Manufacturing Company, Chicago, Ill. No. 839,901. Filed Mar. 11, 1905.

DREDGE—George W. King, Marion, Ohio, assignor to The Marion Steam Shovel Company, Marion, Ohio. No. 839,934. Filed June 2, 1906.

APPARATUS FOR MAKING GAS AND COKING—Leon P. Lowe, San Francisco, Cal. No. 839,939. Filed May 3, 1904.

APPARATUS FOR RECOVERING FROM OIL ITS TARRY OR ASPHALTIC CONSTITUENTS, WITH GAS AS A BY-PRODUCT—Leon P. Lowe, San Francisco, Cal. No. 839,940. Filed July 6, 1904.

ELECTRIC FURNACE—William H. Bristol, New York, N. Y. No. 839,983. Filed Aug. 6, 1906.

APPARATUS FOR ERECTING AERIAL CABLES—Ralph S. Pierce, Chicago, Ill. No. 840,009. Filed Feb. 27, 1905.

CLUTCH FOR AERIAL ROPEWAYS—Giulio Ceretti, Milan, Italy. No. 840,109. Filed Dec. 13, 1905.

MEANS FOR SURVEYING BORE-HOLES—Hugh F. Marriott, Parktown, Transvaal. No. 840,148. Original application filed Aug. 30, 1904, Serial No. 222,776. Divided and this application filed Feb. 21, 1905.

PULLEY FOR PULVERIZING-MILLS—Geo. E. Rudnick, Iola, Kans. No. 840,162. Filed Aug. 13, 1906.

BOSH-PLATE—William D. Berry, New Brighton, Pa. No. 840,195. Filed May 25, 1906.

COAL-TIPPLE—James S. Pates, Monongahela, Pa. No. 840,248. Filed Oct. 11, 1906.

ROASTING OF PYRITOUS MINERALS—Giovanni Rambaldini, Miniera di Boccheggiano, Italy. No. 840,253. Filed Jan. 28, 1902.

SEPARATOR—Walter M. Cook, Ludlow, Vt., asignor of one-half to Christian M. Lauritzen, Chicago, Ill. No. 840,301. Filed Dec. 13, 1905.

METHOD FOR TUNNELING THROUGH ROCKS—Patrick Ford, Chicago, Ill. No. 840,307. Filed Dec. 26, 1905.

MINER'S GOLD-PAN—Thomas Hussey, Hollywood, Cal. No. 840,333. Filed Apr. 30, 1906.

ORE-SEPARATOR—Matthew R. Lyle, Oakland, Cal. No. 840,354. Filed Nov. 10, 1905.

CHEMICAL APPARATUS—Horace B. Snell, Jacksonville, Fla. No. 840,391. Filed Jan. 8, 1906.

GREAT BRITAIN

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Published Week Ended Dec. 29, 1906.

ZINC OXIDE PROCESS—N. M. Ogle, London. Producing zinc oxide from ores by leaching out with sulphuric acid obtained by roasting the ores and roasting the sulphate of zinc so obtained with carbon. No. 24,238 of 1905.

HARDENING TOOL STEEL—S. N. Brayshaw, Manchester. In hardening high-speed steels, first heating in a bath to a temperature considerably above hardening point, then reducing the temperature in a bath to about hardening point, and afterward quenching in a cold bath. No. 25,004 of 1905.

PULP SIZING APPARATUS—J. M. Callow, Salt Lake City, U. S. A. Improvements in the structure of sizing machines for fine pulp, consisting of traveling belts of sizing cloth. No. 26,566 of 1905.

MINE CARS—J. H. Hollings, Sheffield. Improved locking device for coupling mine cars. No. 26,653 of 1905.

DRY AIR APPARATUS—A. S. Haslam, Derby. Improvements in the inventor's system of removing moisture from air used in metallurgical operations, consisting of preliminary cooling the air by passing it through ammonia refrigerating apparatus before passing it over chloride of calcium. No. 1665 of 1906.

ELECTRIC FURNACE—O. Frick, Saltxjobaden, Sweden. In electric smelting furnaces, dividing the operation into two parts, the melting being done in a preliminary chamber with a different type of current. No. 10,097 of 1906.

ELECTRIC DEPOSITION OF METALS—A. Ramen, Helsingborg, Sweden. In the electric deposition of metals, improved methods of making depolarizing solutions, so as to reduce the amount of current employed. No. 18,080 of 1906.

Published week ended Jan. 5, 1907.

CONCENTRATING TABLE—J. S. and P. Rodda, Redruth. A concentrating table formed in two sections with separate water supplies; the lighter sands being removed with first section and closer separation effected in the second section. No. 25,120 of 1905.

MAGNETIC SEPARATOR—W. Simpkin and J. B. Ballantine, London. Improvements in magnetic separators for concentrating iron ores, in which the revolving drum is of non-magnetic material, and the two poles are inside and outside the drum respectively. No. 25,748 of 1905.

PULP GRINDER—J. H. and J. M. Holman, Camborne. An improved grinding machine for wet pulp in which the grinding is effected between the muller and the vertical sides of the machine as well as between the muller and the bottom. No. 1406 of 1906.

TEMPERATURE INDEX—F. and H. F. Huntsman, Sheffield. For the purpose of ascertaining the temperatures of steels during the hardening process, arranging a series of different colored silks in sealed tubes colored to represent the various temperatures. No. 1969 of 1906.

COAL CUTTER—J. Elfert, Mulheim, Germany. Arranging coal cutting teeth in a wire cable, by means of which coal can be cut in large blocks. No. 7079 of 1906.

PROTECTING STEEL ARTICLES—C. S. A. Tatlock, Glasgow. For the purpose of coating steel articles with a protective coating of magnetic oxide, plunging the articles into molten nitrate of soda. No. 7757 of 1906.

METALLURGICAL PROCESS—Societe Electro Metallurgique Francaise, Froges, France. A process for manufacturing an iron with a minimum of carbon contents that may be cast without the occurrence of bubbling. No. 13,189 of 1906.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

H. W. Hardinge, New York, has gone to Chicago on professional business.

S. A. Worcester, of Victor, Colo., is engaged in professional work at Bellevue, Idaho.

T. R. Miller, of Denver, is in the Black Hills of South Dakota on professional business.

David H. Lawrance, of Denver, has been making examinations in the upper Clear Creek district in Colorado.

Edwin E. Chase arrived in Denver from California and Nevada last week and left again for Mexico on professional business.

Dr. F. M. Simonds, of the firm of Simonds & Burns, New York, left last week for a trip to Arizona on professional business.

Chas. Pfeihl, of Denver, has just returned home after making some examinations of zinc mines in southwestern Missouri.

Chas. S. Walter, vice-president of the Security Investment and Mines Company, of Denver, Colo., is visiting Eastern cities on business.

Carl Scholz, of Chicago, president of the Rock Island Coal Company, spent Jan. 10 and 11 at the Indian Territory mines of his company.

Edward L. Dufourcq is making examinations of mining property in Shasta county, Cal. He expects to return to New York about the end of February.

Col. L. Kingsbury, general manager of the Summit Banner Placer Mining Company, and also of the Buffalo Placer Company, is in Denver on his way south.

Hermann A. Keller, mining engineer, of New York, is now at Planet, Arizona, where he will be engaged on professional business until about the end of March.

Charles R. Keyes, who has been president of the New Mexico School of Mines, Socorro, New Mexico, closed his connection with that school at the end of the year 1905-6.

W. E. Wilson, of Boulder, Colo., has been elected president of the Lost Bullion Spanish Mines Company, of Silver City, N. M., and is now on a visit of inspection at the property.

A. D. Benton has taken a position with the Paymaster Consolidated Mines Company as manager, from Jan. 1. The mines are 24 miles south of Tucson; address, Tucson, Arizona.

Herbert S. Dyer, geologist, of Portland, Me., has been for several years engaged in securing mineral rights to deposits of mica, feldspar, graphite and molybdenite in Maine.

Prof. A. L. Parson, who has held the chair of mineralogy at the University of Minnesota for the last four years, has been appointed lecturer in mineralogy at Toronto University.

Peter L. Cummings, of Breckenridge, Colo., has been appointed superintendent of the Wellington Mines Company, operating in Mineral hill and French gulch in the Breckenridge district.

John Duer Irving, who has been professor of economic geology at Lehigh University, has been appointed to the same chair at Yale. Professor Irving is the editor of *Economic Geology*.

Thomas F. E. Fitzgerald has resigned his position as manager of the Federal Lead Company, at Flat River, Mo., to take effect Feb. 1. He is succeeded by Edmund S. Kirby, as manager.

W. W. Keefer has retired from his position as general superintendent of the Pittsburg Coal Company and the Monongahela Consolidated Coal and Coke Company, after four years of service.

A. A. Talmage has moved his office from the Union Trust building to the Chamber of Commerce building, Los Angeles, Cal., where he is associated with the Pittsburg-Salt Lake Oil Company.

E. G. Spilsbury, mining engineer, of New York, recently suffered a serious accident, while in Arizona, and is now in a hospital at Nogales. He made a misstep from a porch and fell, breaking a leg and an arm.

Franklin Bache, of Fort Smith, Arkansas, president of the Kali-Inla Coal Company, the Bache & Denman Coal Company, the American Smokeless Coal Company, and the Mammoth Vein Coal Company, spent Jan. 10 and 11 at McAllister, Indian Territory.

Obituary

J. M. Hower, general manager of the Dorcas Mining and Milling Company, died recently at Florence, Colo. Mr. Hower was 60 years of age. The Dorcas mill, which he operated for a number of years, was destroyed by fire about a year ago.

The body of W. A. Walter, a pioneer mining man of the San Juan, was found recently at the bottom of a shaft on a prospect he was developing near Silverton, Colo. His death was evidently the result of an accident, which probably occurred a number of weeks before the discovery of the body. Mr. Walter's son, E. N. Walter, is superintendent of the Ross mill at Silverton.

John R. Wilson died suddenly of apoplexy, at Deadwood, S. Dak., Jan. 5. He settled in the Black Hills when that section was new. Having a thorough law training, he rapidly rose to the front rank at the bar, and followed that profession for 20 years. During the past five years his time was largely devoted to the Gilt Edge-Maid Mining Company, of which he was secretary and general manager. Mr. Wilson was instrumental in forming and financing this company, and had invested largely in it, faith in the Black Hills being one of his strongest traits.

Capt. Samuel T. Curtis died at the hospital in Goldfield, Nev., Jan. 6. He was superintendent of the Hale & Norcross, Ophir and Andes mines at Virginia City at different intervals and his last positions in that capacity were at the Iowa and Keyes. He was one of the most prominent mining men in the early history of the Comstock, where he resided until the late seventies, returning to the lode in 1886 from Mexico, where he also was manager of a mine. At one time his opinion on mining properties was considered on the Comstock infallible and he made several fortunes during his career, which were lost in speculation and unprofitable investments. He drifted into Goldfield about a year ago where he died penniless. Before entering the mining field he was a sea captain. He leaves a family in San Francisco and was aged about 85 years.

Societies and Technical Schools

University of Wyoming—The catalog of this institution, at Laramie, Wyo., calls special attention to the School of Mines, which is now well equipped for instruction in its department.

Engineers' Society of Western Pennsylvania—At the annual meeting recently held in Pittsburg, S. M. Kinter was elected president; George T. Barnsley, vice-president; A. E. Frost, treasurer; Edmund Yardley, secretary; R. A. Cummings and Walter Riddle, directors for two years; F. Z. Schellenberg and J. O. Handy, directors for three years.

Industrial

Aetna furnace, at Aetna, Tenn., has been sold to J. J. Gray, Jr., of Mt. Pleasant, Tenn. The sale includes 2000 acres of land containing brown hematite iron ore. Mr. Gray is president of the Rockdale Iron Company.

The Traylor Engineering Company, New York, has secured the services of Edward J. Smith, late of Portland, Me., as manager of its works at Allentown, Penn. Theron H. Tracy has been made general manager of sales, with headquarters at the New York office.

The Texas Fullers' Earth Company, Dallas, Texas, has recently awarded a contract for the complete equipment of its plant for dryers, crushers, pulverizers, etc., the J. R. Alsing Company, of 136 Liberty street, New York. The first shipment of machinery will go forward the latter part of this month.

A large order for gas producers has been given to the Wellman-Seaver-Morgan Company, Cleveland, Ohio, by the United States Steel Corporation; it calls for 64 Hughes mechanical gas producers for the Duquesne Steel Works. These producers are to be driven by electric motors, and are equal in gas producing capacity to 160 hand-poked producers.

The Vulcan Iron Works Company, Toledo, Ohio, has, during the past year, materially increased the capacity of its plant. New machines, of the latest and most improved types, have been installed, such as heavy steam hammers, lathes, boring, turning, milling, punching, and shearing machines, besides two large water-tube boilers with a capacity of 200 h.p. each, and a new Ingersoll-Rand air compressor, with a capacity of 750 ft. of air. An important feature is the completion of a new and separate shop for taking care of repair work. These conditions were brought about by the increasing demand for heavy duty shovels.

The Compania Minera Borda Antigua y Anexas, whose mines are located close to the Dos Estrellas mines, near Tlalpujahua, Mexico, has recently placed an order with G. & O. Braniff & Co. for an electrical installation for the mines. The motors, transformers, etc., will come from the works of the Westinghouse Electric and Manufacturing Company, Pittsburg, and the pumps from the Byron Jackson Machine Works, of Oakland, Cal. There is already on the ground, being erected, a 250-h.p. Lidgerwood steam hoist, purchased before electric power entered the camp. The Westinghouse people will attach to this hoist a standard 150-h.p. alternating-current hoist motor, the only necessary change in the hoist being the adding of gear and pinion to adapt the drive. There will be four horizontal centrifugal pumps, direct coupled to alternating current motors; also, two motors for driving blower for ventilating the mines. Three 50-kw. transformers will be used to change the voltage of the Mexican Light and Power Company's circuits from 3000 volts to 400 volts, for motor and lighting work.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Clinton Wire Cloth Company, Clinton, Mass. Clinton Wire Lath. Pp. 52; illustrated; boards, 6x9 in.; 1907.

Jenkins Brothers, New York. Jenkins Brothers Valves and Packing. Pp. 128, illustrated, indexed; paper, 6x9 in.; 1907.

Wonham-Magor Car Works, New York. Industrial Cars and Track. Pp. 160, illustrated; indexed; paper; 6x9 in.; 1907.

Arthur Koppel Company, Koppel, Pa. Album, 1907. Illustrations of Industrial Railway Material. Pp. 26, paper, 4½x6 in.

Seebohm & Dieckstahl, Ltd., Sheffield, England. Hints to Practical Users of Tool Steel. Pp. 58, illustrated, indexed, paper, 4½x7½ in.

Ingersoll-Rand Company, 11 Broadway, New York. Catalog No. 91. Davis Calyx Diamondless Core Drills. Pp. 62, illustrated; paper; 6x9 in.; 1907.

Sullivan Machinery Company, Railway Exchange Building, Chicago, Ill. Catalog No. 55. Sullivan Diamond Core Drills. Pp. 157; illustrated; paper; 6x9 in.

Atlas Engine Works, Indianapolis, Ind. Bulletin No. 134. General Bulletin of Illustrations and Specifications. Pp. 23, illustrated; paper, 8x10½ in.; Nov., 1906.

H. W. Johns-Manville Company, 100 William street, New York City. "Reasons Why." "J.-M." Giant Strain Insulators. Four-page folder, illustrated; 3½x6 in.; 1907.

W. Harold Tomlinson, 44 E. Walnut Lane, Germantown, Philadelphia, Pa. Catalog of Rock and Mineral Sections and Sets. Pp. 24, illustrated; paper, 6x9 in.; 1906.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin No. 1045. Allis-Chalmers Rotary Converters. Pp. 15, illustrated; paper 8x10½ in.; October, 1906. Bulletin No. 1040. Allis-Chalmers Polyphase Induction Motors. Pp. 20; illustrated; paper; 8x10½ in.; November, 1906.

Construction News

Keystone, South Dakota — The Holy Terror-Egyptian Company is preparing to enlarge its present mill to 40 stamps.

Bingham, Utah—The Bingham-New Haven Company is considering the question of putting up a smelter. Charles H. Doolittle, Salt Lake City, Utah, is manager.

Bartow, Florida—The Bartow Cement Stone Company is putting up a plant to make cement and concrete building blocks. John Bishop, Bartow, Fla., is superintendent.

Somerville, Texas—Work has been begun on a plant preparing fullers' earth for market; also for mining and handling the substance. N. W. Dunham, Somerville, Texas, is general manager.

Mount Pleasant, Tennessee—The Blue Grass Phosphate Company and the Jackson Phosphate Company are both preparing to put in drying plants for phosphate. Address of both at Mount Pleasant, Tennessee.

Eagle Pass, Texas—The Olmos Coal Company has purchased or leased several tracts in Maverick county, and will open coal mines. Machinery will be needed. L. M. Lamar, Eagle Pass, Texas, is managing the enterprise.

Special Correspondence

San Francisco Jan. 17

It is gratifying news to the San Francisco people who still have faith in the Comstock mines to learn that the Ward shaft has been drained and that the bottom of it has been reached at a depth of 2481 ft., where work was suspended 23 years ago, when the great mines of the Comstock declined. It is now the intention of the company to sink the shaft to the 300-ft. level, and to work the mine and develop the lower workings to a considerable extent.

The recent storms have brought exceptionally heavy snowfalls in the mountain regions, and rainfall in the foothills, causing high water in all the streams. The miners are happy in being insured a long water season for the coming summer. Judging from the amount of snow already fallen, there is little chance of the mills having to close down early in the fall, as has been the case the past few years, when the water supply gave out some time before the rain commenced.

A dredge-mining company has bought about 1700 acres of the famous Natoma vineyard, near Folsom, Sacramento county. It is provided in the deed that all of the personal property belonging to the Natoma Vineyard Company, shall pass into the hands of the mining company. This will include live-stock, tools and implements, grape boxes, stills, boilers, winery, machinery in distillery, cooperage, houses and barns. It also takes in all of the canal and water rights, water ditches and dams. It is understood that six new gold dredges of the largest capacity, will be built this year to work in the gravel beds, near Folsom.

Butte creek, Butte county, is to be dredged. The machine will not be put in a floating basin, but will be used on tracks laid on the surface. The numerous tunnels already in the bank where the dredge is to begin its work, would necessitate a supply of water larger than Butte creek could supply, if the boat type of dredge were used.

The acting commissioner of the general land office has announced the withdrawal from entry of all the lands in the Del Norte mining district, California, which has recently been recommended as an addition to the national forest reserve by the miners of the district. The district in question, which will soon be known as a part of the Klamath forest reserve, comprises some 155,580 acres lying in Del Norte county and bounded on the north by the Oregon State line. These lands will be inspected as soon as conditions will permit, and they will undoubtedly soon be added to the Klamath reserve. The action of the miners in this matter is without precedent, and goes to show that they are awakening to the fact that their

only safety against the assaults of the timber grabbers lies in the protection of the United States forest service.

Lewis E. Aubury, who has been State mineralogist of California for the past six years, has been reappointed to the position by the governor, and will hold the office for two years more. Mr Aubury has been an active and energetic official and this reappointment was to have been expected as a recognition of services. At the end of his first term there were several prominent aspirants for the position, but the governor declined to appoint any of them and finally gave the office again to Mr. Aubury. Many valuable bulletins, maps, registers, and other publications have been published by the State mining bureau since Mr. Aubury took charge. He has taken an active part in preventing timber men from acquiring mineral lands in the mining regions; also in prosecuting men who have been selling mining stocks on a fraudulent basis. He was mainly instrumental in having the law passed which punishes by fine and imprisonment those who publish misrepresenting and exaggerated statements concerning mining properties in California. Altogether Mr. Aubury may be said to have made a very satisfactory State mineralogist, and will now be able to carry out further plans for advancement of the mineral industry of the State.

Interest still centers in the mining developments in and around Greenwater district, in Inyo county, although as yet none of the camps in that region has become productive. The long talked of merger of extensive Greenwater interests has taken place. The combination takes in the Greenwater & Death Valley Company, which is controlled by the Schwab interests, the United Greenwater Company, controlled by the Nevada Smelting and Mines Corporation, and the interests controlled by Brock and the Philadelphia capitalists, which have not been organized. The basis of the distribution of stock on which the consolidated company was formed is as follows: Greenwater & Death Valley, 68 per cent.; United Greenwater, 18; Brock Syndicate, 14 per cent. It will be seen that the Schwab interests are in control. The smelter will be located at Ash Meadows, Nevada, about 30 miles northeast of Greenwater. This is 42 miles from Rhyolite, 115 miles from Goldfield, and 143 from Tonopah. On the property of the company are extensive deposits of lime and iron. Fuel will be brought from the petroleum fields of California over the Borax Smith road.

An important factor in the advancement of these new camps is that of water supply. B. C. Brockington states that he has located a flow of water carrying 1,600,000 gal. each 24 hours of pure, cold water, 600,000 gal. of which will flow across the Funeral mountain to Greenwater by gravity. One million gallons of this flow has an altitude of 4000 ft., and it can be utilized for generating electrical power, to be used for operating mines, furnishing electric lights for the towns of the desert, which are growing up and will continue to grow. This 4000-ft. elevation occurs in a distance of six miles from Death valley. The water is located on Telescope peak, in the Panamint range, which is 10,984 ft. high. The location is about 20 miles in an air line from Greenwater, and a pipe line 25 miles long will bring it to town. At the point where the pipe line would cross Death valley it is 34 ft. below sea level. This would be at Bennetts Well.

The newest town in the desert region of Inyo county is called Skidoo, after Robert Montgomery's mine of that name. It is 40 miles north of Ballarat, 45 miles west of Rhyolite, and about the same distance northeast of Keeler, at an elevation of 5500 ft. The long haul prevents shipment of ores, and a mill is being built to treat ores on the spot, not only for the Skidoo mine, but for lessees or custom men. The mill will be operated by electricity generated by water power.

The prospects for an early settlement in the miners' strike at Grass Valley do not appear favorable. The men insist on an eight-hour day, and that the companies begin to hoist the men at 3:30, and guarantee to have them all out of the mine by 4 p.m. each day. The pumps on the mines are kept running, but the union held a meeting and decided to call the pump men out unless the operators granted them an eight-hour day. This, of course, had to be conceded at once to avoid flooding the properties. The business men of Grass Valley have petitioned Mayor Clinch to intervene and settle the strike. He has accepted the task and will endeavor to get the operators and miners together and, through concessions on both sides, settle the strike. About 150 miners have left the district since the strike started.

By the terms of a decision rendered by G. F. Potter, assistant land commissioner at Washington, D. C., an area of about 4000 acres on the Forest Hill divide, in Placer county, is mineral land. The tract is close to the Hidden Treasure, Turkey Hill, Bullion, Damascus, Eureka and Pioneer mines, above Michigan Bluff. The decision confirms the miners' rights.

For the first time in 20 years hydraulic mining on a large scale is to be carried on in the district near Alleghany, Sierra county, as soon as the rains convert the heavy snows now lying on the hills into water. An extensive hydraulic plant has been installed by the Alleghany Mining Company, operating at Balsam Flat, 1½ miles south of Alleghany, to work the placer gravel deposit formerly known as the McNulty claim. A débris dam has been built at Whiskey Point, and has been accepted by the California Débris Commission. W. W. Tiner is superintendent of the company.

C. D. Hitchcock, the mechanical engineer of the Balaklala Consolidated Copper Company, has arrived from Salt Lake to take charge of the operations of installing the big smelter plant, which the company has in the course of erection at Coram, Shasta county. The steel frames for the McDougall furnaces are already in place, and the huge cement foundations for the smelter proper have been laid.

There is quite a little excitement over the discovery of gold and copper ores in the desert region of Ibex district, near Java station, on the Santa Fé line, San Bernardino county. Ledges were discovered in that vicinity in 1892, but little was done with them. Now a great number of location notices are being recorded, and many men are prospecting the region.

Oakland, California, men, headed by F. J. Swears, of Goldfield, have organized the Goldfield Diamond and Drilling Company. They have purchased three plants and now have them en route to Goldfield. On their arrival, one or more of the drills will be installed on the Corinth claims, in the eastern part of the district, near the Rochester goldfield, and holes will be bored to a depth of 1000 ft., and an endeavor made to locate some of the pay shoots.

The Stanislaus Electric Power Company has just contracted for a new equipment, which will generate a larger horsepower than that generated by any plant or station in the State. The new power plant is located at Stanislaus, about 12 miles northeast of Sonora, in Tuolumne county. It will have a capacity of over 36,000 h.p. A narrow-gage railroad 12 miles in length is being constructed, to be used in transporting material and supplies. An immense dam will be erected in Relief valley.

Salt Lake City Jan. 19

Quite a revival in mining activity is noted in Beaver county, particularly in that portion of it near the town of Milford. Recent developments in the Star district have revealed the presence of lead-silver ore in quantity. Around Frisco and Newhouse developments in some of the copper properties have been of a satisfactory character, while down in the extreme southeastern portion of the county, in the Pine Grove district, the Revenue Mining Company, of which L. G. Burton, of Salt Lake, is manager, shows developments of gold ore. The ores found in the Pine Grove district carry values principally in gold. It is understood an effort is being made to re-open the old Lincoln mine, which includes the first claim patented in Utah.

The Federal grand jury has resumed its investigation of the alleged coal-land frauds, and has ordered a civil suit brought against the estate of the late Stanley B. Milner, who, it is claimed, secured title to coal lands in Emery, Carbon and Iron counties not exactly in accordance to law.

The management of the Bingham-New

Haven Company has reported an important strike on the lower or tunnel level of that property. A vein of ore was encountered 870 ft. in from the portal of the tunnel, and has been crosscut for 128 ft. In character, the ore is similar to that produced in the Highland Boy mine of the Utah Consolidated Mining Company. The matter of building a smelter is receiving consideration. Charles H. Doolittle, of Salt Lake, is manager.

The Alice Consolidated Mining Company has been formed in Salt Lake to operate in the Dugway section of the Deep Creek district. The basis is six claims favorably situated in that camp. The incorporators are: W. R. Hutchinson, president; W. F. Calloway, vice-president; C. C. Dailey, secretary and treasurer, who, with B. L. Cutler and R. E. Miller, are directors.

The Bingham Consolidated Mining and Smelting Company has secured a 60-day option on the Iosepa farm, which for several years has been occupied by a colony of Hawaiian converts to the Mormon church. The land is situated about 50 miles west of Salt Lake, on the line of the Western Pacific Railroad. If the railroad companies will consent to making the place a Utah common point, it is probable that the option will be executed and the future smelting operations of the Bingham company conducted there.

The business interests of Bingham Junction and Murray have been so thoroughly aroused over the removal of the copper smelters out of the Salt Lake valley, as a consequence of the late decision and injunction of the Federal court, that they are making an organized effort to bring about their retention. No matter what happens, however, the Utah Consolidated and Bingham Consolidated companies have decided to abandon their present plants and build elsewhere. There is little doubt about the Utah Consolidated going to a point about four miles above the town of Tooele, and on the opposite side of the Oquirrh range of mountains from the mine. The latter will be connected with the smelter by means of a tunnel. Employees will be permitted to make their homes in the town of Tooele and will be conveyed to and from their work by electric cars.

A settlement has been effected between the Magnolia-St. Louis Mining Company and the Silver King Mining Company, of Park City. The former brought suit to recover $900,000, the value of ore alleged to have been extracted from the domains of the plaintiff. The Silver King Company has acquired the property of its opponent, but the terms of the agreement have not been released. The Silver King Company has suspended dividend payments temporarily.

The Frisco Contact Company has started its new compressor plant and is now developing by means of machine drills.

Toronto, Ont. Jan. 21

In order to aid the development of the mining industry, the Timiskaming & Northern Ontario Railway commission is taking preliminary steps toward the construction of two more branch lines. One of these will open up the Larder Lake gold area, running east from Englehart for 12 miles or more. The other will run for five or six miles either from Cobalt town or Gillies Station, to tap the Portage Bay area. Inspections of the proposed routes preliminary to surveys are now being made.

The summary report of the Geological Survey of Canada for 1906 has been published. It anticipates that when the figures of the mining production for the year are available they will show a large increase over those for 1905, in which year the output was $68,574,000. Director Low paid a three-day visit to Cobalt camp, looking over a number of the more prominent mines and claims, during which enough was seen to pronounce upon the phenomenal richness of the numerous veins and to make a rough estimate that millions of dollars in silver show on the surface, and in the shallow workings of the claims. "The question of the depth to which the silver will be found," says Dr. Low, "is an important one, but it is one upon which no opinion can or should be given with the data at present available." He goes on to say that while there is no doubt that great values will be extracted from the properties about Cobalt, it might be wise for the investing public to consider the very large capitalizations and abnormal prices of stock of many of these properties, and the large sum required from production to pay a fair profit on these small veins. Attention is also called to the limited area covered by the silver-bearing veins and the impulse to consider properties situated in the vicinity of bonanza claims, as being themselves of great value when the reverse is often the case. "Cobalt is now in the throes of the inevitable great speculative boom, and prices are being advanced in many instances beyond the bounds of prudence and reason."

London Jan. 12

A few weeks ago I mentioned that the Nerchinsk Gold Company, one of the pioneers of Siberian development, had floated a subsidiary company to work the Kluchi mine. This week a further flotation has been effected. In this case the property in question is not a developed mine, but a tract of territory on which only a little prospecting has been done. The new company is called the Nerchinsk Options, Ltd. According to Pearse, Kingston & Browne, the consulting engineers, the prospecting thus far done has proved the outcrop of gold-bearing veins, which fully warrant systematic development. While writing of Siberian matters, I may say that although promoters are inclining to look to Siberia for a new hunting ground, there is no boom in Siberians, and it is well to point out that the Russian laws as to ownership by aliens are sufficiently severe to prevent any etxensive acquisition of properties by English syndicates. There is, in fact, a small storm raging in financial circles in London as to whether certain leases, etc., in Russia, worked by English companies are all in order or not, and it is practically impossible to obtain any authoritative information, even from Russian officials themselves, as to the exact requirements of Russian laws on this question. In the near future it is probable that a good deal will be heard of this tenure difficulty.

A further issue of 30,000 shares at £7 5s. each has this week been made by the Otavi Mines and Railway Company, which owns property in German Southwest Africa. Operations were commenced in this territory some 15 years ago, and in 1900 the late Christopher James, the well known mining engineer and metallurgist from South Wales, spent a year investigating the country. The district is a copper-bearing one, and the copper ore occurs concurrently with galena. The developments done by Mr. James and other engineers have opened up large bodies of ore, and during the past six months arrangements have been made for erecting smelters. The properties are 350 miles northeast of the port of Swakopmund, and the company has built a railway between these two points. There is already a government railway between this port and Windhoek, the capital of German West Africa, and for the first hundred miles it might have been possible to use the same track for both railways, but for some reason the two railways have been built quite independently. It should be mentioned that the Otavi company is incorporated under German colonial laws, and is not a British registration; the promoters are all German firms. A good deal of the capital, however, has been subscribed in England.

Public interest in the Cornish mines will be increased considerably within a short time, owing to a scheme nearly completed for buying up the lord's rights in the Camborne district by a London syndicate. Hitherto, the owners of the land in Cornwall have jealously guarded their rights to a percentage of the gross output of the mines, and, as in many cases the amount paid in this way has been the bare margin between profit and loss in working, it has been supposed, rightly or wrongly, that the landlords' dues were a stumbling block in the way of mining enterprise. As I have already mentioned in these columns, the Cornish Consolidated Syndicate, which is headed by Francis Allen, a London lawyer, and Messrs. Meyerstein, the stock brokers, has introduced considerable sums of London money into Cornwall during the last year or so. In order to enable them to extend still further their

operations without the necessity of consulting the landlords, they have made a bargain with Mr. Basset, the principal landlord, to buy out the whole of his mining rights. Mr. Basset's estate includes such big producers at Dolcoath, East Pool, South Crofty and Basset, and the income he draws from these is estimated at £15,000 a year. It is probable that he will require £250,000 for his rights. At the time of writing, the matter is not definitely settled, though within a week or two the complete details will be arranged. This deal is a big one, and the Cornish Consolidated has secured the co-operation of several other important groups, such as the Venture Corporation, for the purpose of underwriting the issue of shares in the company to be formed to take over these rights. How the new company will deal with the rights remains to be seen, but it will probably take large lumps of net profits instead of proportions of gross outputs. In the case of Dolcoath, the change of landlordship may lead to important events, for in March next the present low rate of dues accepted by Mr. Basset a few years ago in order to encourage the company to spend more capital comes to an end. The relations between the new landlords and the Dolcoath company will be watched with interest. In the meantime Cornishmen are pleased at the prospects of more money flowing into their county.

Johannesburg Dec. 24

The Boers have received the new constitution given to the Transvaal by the Liberal government, with keen satisfaction, for everything is in their favor. The British here are not at all pleased with the document, and they complain bitterly of the policy of the Liberals.

To the mining community the articles dealing with the natives and with Chinese labor are of most importance. From the first reading one would judge that the question of Chinese labor is definitely settled, for it is stated that the Chinese must leave one year after the first parliament meets. Should the first parliament so desire, they can send the Celestials away before the year is over.

There is one ray of hope. Provision is made for changes in the constitution, and if there is a majority of the first parliament in favor of the retention of the coolies, no doubt the yellow men will remain on the Rand. The pro-Chinese party is known as progressive. Realizing that the whole Chinese question depends upon their success at the polls, the Progressives are making a strenuous fight, and are now in a much stronger position than they were a few months ago. In spite of everything, the leading men here still maintain that the Chinese will not leave the country. It is expected that the elections will be held some time in February, and parliament will meet in Pretoria about July next.

During the past fortnight there have been very welcome announcements by many companies of dividends payable for the year. There is a big variation in the amounts paid out, from 15 per cent. in the case of the Ferreira mine, to 5 per cent. in the case of the New Modderfontein and the French Rand. The last named mines make their debuts as dividend payers. For a long time they have been paying off debentures, but now by the help of Chinese labor they are able to enter the lists of the dividend mines. The rate paid is small, but it is at least a beginning, and no doubt these two mines will make steady declarations of dividends provided the Chinese remain.

Tube-mills are doing well. At present there are 58 tube-mills in working order along the Rand, and several other mines are expecting to erect one or more of these grinding machines. With tube-mills the crushing capacity of the larger mines on the Rand has been greatly increased. The largest gold-milling plant under one roof in the world is on the Rand, that is the joint plant of the Knight's Deep and Simmer East, with 400 stamps. This plant cost £549,563.

The following list shows the 13 batteries, each containing 200 stamps or over:

	Stamps.	Tube Mills.
Knights Deep-Simmer East	400	3
Simmer & Jack Proprietary	320	..
Crown Deep-Robinson Central Deep	300	5
Robinson Deep	300	2
Angelo	200	2
Cason	220	2
Dreifontein	220	2
Knights	220	..
Robinson	210	3
New Kleinfontein	200	..
Geldenhuis Deep	200	3
Rose Deep	200	3
Witwatersrand Deep	200	..

In spite of the hard times and the scarcity of labor, there are any amount of flotations going on. Diamond companies seem to be the favorites. An alluvial gold proposition, about 25 miles west of Pretoria, has come in for a lot of notice. If boom times ever come around again there will be a plethora of mines of all kinds floated. At the present time deep levels are out of favor. Only highly speculative propositions seem to be wanted just now.

Although it is some months yet before the election, the different factions are getting ready for the fray. As a rule the Rand is distinctly lethargic as far as politics are concerned, but the amount of interest being shown now is worthy of America in a presidential election. The British women have formed themselves into a federation, for the purpose of promulgating British ideals in South Africa. The Boer women have formed a society of their own. Altogether we can expect lively times early next year when the elections come off.

General Mining News

CALIFORNIA

AMADOR COUNTY

Kennedy—The east ledge of this famous property at Jackson has been struck at the depth of 3000 ft., the rock being of fair milling grade.

Argonaut—The new purchasers of this mine at Jackson will assume charge next month, with Mr. Matthews as manager.

BUTTE COUNTY

Steiffer—This mine near Magalia has struck pay gravel. The mine is adjacent to the old Perschbacker, which yielded handsomely for years. It has been under development for two years past.

INYO COUNTY

Great Western Ore Purchasing and Reduction Company—At a meeting of this company, whose property is at Keeler, Chas. M. Schwab was given an option on the mine for 30 days.

Mining District—At Big Pine a district has been formed, and Nevada laws adopted, to take in Saline and Eureka valleys, Little Cow Horn, Big Cow Horn, Fish Lake valley and Deep Springs. Copper, gold and silver are found in the district, which needs only development and railroad connections to come to the front.

Southern Belle—The main shaft in the Bullion mine of this company, A. E. Vandercook superintendent, is nearing the 400 level. The orebody is quite wide and carries fine gold.

Keane Wonder—A 20-stamp mill is being constructed and an aërial tram will carry the ore from mine to mill. The company owns 22 claims on the Death Valley slope of the Funeral Range. One ledge is 30 ft. wide and shows well in gold.

Ubehebe—In this district are several promising claims, wire-gold and native copper have been found in close proximity. The Salsberry claim has a good force of men at work, with J. V. McConnell as superintendent. Two shafts have been sunk, and one is to be sunk to 500 ft. depth. Both carbonate and native copper are in the ore.

KERN COUNTY

California Rich Gulch Mining Company—This company has now 15 claims, having recently acquired five more. In the New Hampshire, particularly, good ore is exposed carrying gold, silver and copper.

Kern River Gold Mining Company—This company owns two claims on the Kern river at the point where the stream is to be diverted for two miles by the power tunnel of the Edison Electric Company, and will begin operations as soon as the water is out of the bed. The river bed will then be mined. Meantime pipe borings have been made through the

gravel and the returns are satisfactory. In addition to the gold there is considerable platinum in the gravel at this point.

MARIPOSA COUNTY

Devil's Gulch—At this place near Hites Cove, Heaton & Branson have discovered a 3-ft. quartz vein carrying free gold, and the mine has been bonded to Mr. Richards, of Hites Cove.

MONO COUNTY

Masonic District—James T. Shaw is arranging for an electric power plant for this district and has ordered the necessary machinery. Both the Calivada and Pittsburg Extension companies have good ore in their claims.

NEVADA COUNTY

Lincoln—San Francisco men have this mine under bond and are sinking a shaft, at the bottom of which is a small vein of high-grade ore.

Grass Valley—All the mines in Grass Valley district are at present closed down owing to the strike of the miners employed in them, who demand an eight-hour day. The matter has not yet been settled.

PLACER COUNTY

Invincible Mining Company—This company has bought, from George McAulay, eight mining properties on the Middle Fork of the American river, five miles from Forest Hill. These properties are bar-gravel mining propositions, situated on Arkansas Bar, Eureka Bar, Horseshoe Bar, Boston Bar, Pleasant Bar, Winifred-Shirley Bar, American Bar and Willow Bar. The last three were Mr. McAulay's claims and the others belonged to the Horseshoe Bar Consolidated Mining Company. The Invincible company is composed of San Francisco and Oakland capitalists and they intend to commence work on the mines at once and will spend a great deal of money in their development.

Barton—At this mine 25 men are at work, and a new steam hoisting plant has been installed.

Big Dipper—In this old drift mine, Iowa Hill divide, the lessees found rich gravel in some of the pillars, taking out in places as high as $80 to the pan.

PLUMAS COUNTY

Arcadia—At this mine, near Greenville, owned by D. McIntyre, a contract has been let for 100 ft. of tunnel, by which it is expected to tap the rich chute of ore which was worked near the surface some years since.

SAN BENITO COUNTY

Florence Mack — At this quicksilver mine considerable ore is being taken out, and the output will shortly be increased.

SAN BERNARDINO COUNTY

Salt—G. A. Davidson, W. H. Brewer and B. F. Levet, of the Santa Fe Railroad Company, are opening beds of pure salt near Daggett and will soon place the material on the market. The closing down of the Liverpool Salt Company's works by the overflow of the Salton sea has made this new property of considerable value.

Silver Lake and Five Point—Some 50 locations have already been recorded in these new districts, and about 100 prospectors are at work in the vicinity.

Ord Mountain—In this region, 16 miles south of Daggett, a number of copper claims are being opened.

SHASTA COUNTY

Reid—James Salle, owner of this mine, at Old Diggings, is building a railroad 1½ miles long from the mine to the Sacramento river, to take the place of the aërial cable now in use.

SIERRA COUNTY

Rainbow Extension — This mine has been bonded by H. H. Noble and James Clinton to White & Giles, representing men from Wilkes-Barre, Pennsylvania.

SISKIYOU COUNTY

Dredge—A new Bucyrus dredge is to be set up on Scott river, near Callahan.

Helena Mining Company—The property of this company, James McKean, superintendent, is being reopened and a number of men are at work. There is a fine cyanide plant at the mine.

Helena Development Company—This company, lately organized, has bonded the McKeen mine, near Callahan, from the Helena Gold Mining Company. The mine has produced largely from the upper levels. The intention is to open up the lower levels, where a large orebody is believed to exist. The company is composed of San Francisco men, with A. Sydney Additon as general manager.

TEHAMA COUNTY

Tom Head—On these copper claims a new tunnel has been driven and a good orebody developed.

TUOLUMNE COUNTY

Big Creek—This Bangor, Maine, company has changed its name to Big Creek Electric Power and Water Company. It has refused offers to sell its Golden Rock ditch, water rights, etc.

YUBA COUNTY

A. Steinberger has applied to the California Débris Commission for a permit to hydraulic the Brandy City mine, near Camptonville, the drainage of which is into Cherokee creek.

Bonded — Charles D. Lane and associates, owners of the famous Utica mine, Calaveras county, have taken a bond on the Pennsylvania, Dannenbrog and Hawkeye mine at Browns Valley, and commenced development work. All these mines were producers years ago, but have been closed down some time.

COLORADO

LAKE COUNTY—LEADVILLE

New Monarch—The Cleveland shaft, now 500 ft. deep, will be sunk another lift of 100 ft., and during the week the work was started. Heavier machinery has been installed in the way of extra boilers and pumps and although a heavy flow of water is not anticipated, the management is prepared to meet one if opened in the course of sinking. The Cleveland shaft is to the north of the Winnie, and when the 500-ft. mark was reached a body of gold quartz was opened that ran $6 per ton. It is to develop this orebody that the shaft is being sunk deeper and also to catch the extension of the streak of ore opened in the Winnie last summer. Development work has been steadily kept ahead on this streak and from it a carload and a half has been shipped monthly to the smelter yielding the mine a net profit of $10,000 per car. The work of development has been carried over 1000 ft. on the streak. In addition to the rich ore shipped from the Winnie about 1500 tons monthly of medium-grade ore is being shipped to the smelter.

President, Breece Hill—The first important strike in the district for the new year was made in this property in one of the lower levels at a depth of 500 ft. The property has had rather an eventful history; 28 years ago it was located by Thomas O'Rourke, who is still the owner; he put his own money in to develop it and when this was gone lessees took hold of it. In the upper contact several rich streaks of ore were found, running from 12 to 15 oz. gold per ton and when worked out development was continued to find the main ore-shoot, but it was never located in the upper contact. O'Rourke then sunk the shaft to the lower zone and when his money was gone he again leased the claim. This time, in the northeast drift a splendid body of sulphide has just been opened and the initial shipment has been sent out; the lessees state that it will run $30 per ton. Work is now being pushed on the orebody and sufficient has already been done to prove that the ore is in place and the main channel cut.

Breece Hill—The driving of the Yak tunnel into this section of the district has stimulated mining to a great extent, as water is eliminated and the owners of property are now able to carry on work in the lower levels at greatly reduced cost. Among the mines on the shippers' list are the Vinnie, Big Four, Big Six, Fanny Rawlins, St. Louis tunnel, Highland Chief and Penn, and all are shipping from 30 to 50 tons daily of silicious and sulphide ores. To be added to this list is the work that is being carried on at the four shafts of the Ibex, let out to 225 sets of lessees and employing 450 men. The monthly tonnage is in the neighborhood of 7000 tons of silicious, sulphide and zinc ores, and the average value is close to $100 per

ton. A number of lessees are fortunate every now and again in opening a pocket, from which will be taken from 500 to 1000 lb., adding materially to their bank balance. The lowest work in the property is being done at the 1500-ft. level where the lessees have opened a 5-ft. body of sulphide ore that is just on the edge of being pay; upraising on the orebody will bring the desired values.

Carbonate Hill—This old section is one of the busiest in the camp and the amount of ore that is being shipped daily from the different properties is a little better than 500 tons. At the crest of the hill the Little Nell is shipping about 150 tons a month of ore that will average $100 per ton; all of the shafts belonging to the Morning and Evening Stars are busy shipping iron and from the Catalpa and Crescent shipments are going out steadily, and the same applies to the Wolftone, Maid of Erin and Big Chief.

Dinero Tunnel—The starting of this enterprise in the Sugar Loaf district has been the means of bringing capital to the district in search of investment as it is known to the mining world that the claims in the district carry large bodies of low-grade ore that in the past could not be worked on account of the expense attached to lifting water. This will be done away with as the tunnel cuts into the hill and will drain the section. Another point that favors the district is the reduction made in the treatment charge by the Arkansas Valley smelter for low-grade ores. By early summer it is expected that 500 tons a day of ore will be shipped to the smelter from the different claims.

Lackawanna Gulch—To the south of Sugar Loaf is another section of the district that will receive a great deal of attention next summer on account of the rich ore opened in the Miller group of claims last fall. The main shaft is down 85 ft., the vein 4 ft. wide and the values run from 10 to 15 oz. gold per ton. A five-stamp mill was erected last summer and the run in the fall was highly satisfactory.

SUMMIT COUNTY

Swastika—This is the title of a new incorporation filed to operate properties in Summit and Park counties and capitalized for $2,000,000. Elgin Mawhinney and Joseph H. Chandler, of Chicago, Andrew W. Gillette, of Denver, and C. F. Hazelton, of Breckenridge, are the incorporators.

Col. Sellers—This well known property in Kokomo has changed hands, having been sold by Joseph A. Lamping to Horace B. Hawkins for a consideration of $12,000. This will be worked under the style of the Delaware Gold Mining and Milling Company.

Mize—This is the name of a new organization formed to operate claims in Montana in the Wilkinson district. This company has secured possession of the Winifred, Ruth, Marie, Dorothy and Magnet properties.

Vidler Tunnel Company—It is reported that this company has acquired title to the Wilcox tunnel and railroad properties. It is proposed to extend the Denver, Lakewood & Golden Railroad over Lookout mountain and to traverse the Vidler tunnel, thus making connection with Montezuma and Rathbone. The line will then join the Denver & Rio Grande at Dillon.

Wellington Mines Company—This company has started on its ore-delivery contract and is now shipping the ore at a rate of 75 tons per day. Pike & McClellan have the hauling contract to railroad. Peter L. Cummings has been appointed superintendent of the company.

GEORGIA

LUMPKIN COUNTY

Barlow—At this mine, near Dahlonega, the new shaft is now down 150 ft. below water level. At that point the vein is about 6 ft. wide, running from $4 to $7 per ton in gold. The mill is being repaired and put in order.

IDAHO

BLAINE COUNTY

Croesus—This mine, three miles from Hailey, has resumed after being idle for over two years, on account of certain dissatisfaction among the stockholders. Since commencing operations the company has developed some high-grade galena ore on the lower workings; 20 in. of this ore will average about 2000 oz. silver per ton, besides some gold and 55 to 60 per cent. lead. The main vein is approximately 20 ft. in width and is good concentrating ore; pyrrhotite is the main gold-bearing sulphide, and is the most prominent, while galena and chalcopyrite are disseminated throughout the vein in smaller quantities. The company is working 24 men and running the 10-stamp mill steadily, producing regular shipments of good-grade concentrates.

Nay Aug—This mine, situated on Deer creek some 15 miles northwest from Hailey, is shipping good-grade galena from a 15-in. streak, which seems to be continuous for some distance. The company is driving a long tunnel which will give approximately 200 ft. additional backs from the lowest workings.

Minnie Moore—This mine will resume active work shortly, and the deep shaft now under way will facilitate working the property.

Wood River—This district is feeling the activity in mining and many new discoveries are looked for during the coming spring and summer. Developments at Bullion are progressing rapidly but nothing important has been encountered at this date. Bullion was once famous for its large bodies of high-grade silver-lead ore, but unsystematic developments revealed but little. The companies now operating are working on more substantial lines, and will make good.

CUSTER COUNTY

Custer county will be the center of attraction for gold mining during the coming season. Last year several good discoveries were made and not a few old properties were started up, under modern methods of mining, and the results have been gratifying.

Idaho-Montgomery—Important discoveries have been made by this company, which lately acquired some good property in Washington Basin. The company has opened up large ore reserves and is pushing work; but owing to a late start last fall it is unable to place machine drills and necessary equipment. The company is shaping everything so that an early start can be made for placing the 500-ton reduction plant next summer. The plans have all been formulated. The ore carries well in gold, silver and bismuth. Deeper developments during the winter have shown the continuation of the orebodies with increase in gold and bismuth values in many instances. Out of the five veins there are two carrying values that will justify the erection of the plant spoken of. Nevada capital is behind the enterprise.

INDIAN TERRITORY

CHOCTAW NATION

Degnan-McConnell Coal and Coke Company—This company is opening another shaft mine near Wilburton. This will probably ship over both the Missouri, Kansas & Texas and the Chicago, Rock Island & Pacific Railway. This is one of the largest coal companies in the territory.

KENTUCKY

HOPKINS COUNTY

Daniel Boone Coal Company—The property of this company at Boone, near Madisonville, has been sold to Andrew Hogg, of Madisonville, and associates. The property covers 3000 acres of land, on which a mine has been opened.

MARYLAND

Consolidation Coal Company—This company's statement for the year 1906 shows net earnings over fixed charges, $1,332,844; dividends received, $180,000; total, $1,512,844. The charges for depreciation on plant, etc., were $77,977, leaving a surplus of $1,434,867. The board declared an extra dividend of 2 per cent, in addition to the regular quarterly payment, making 3½ per cent. in all.

MICHIGAN

HOUGHTON COUNTY—COPPER

Wyandot—It is reported that the Winona lode has been intersected by a crosscut at the 1000-ft. level and drifts have been started both north and south on the vein.

MONTANA

BUTTE DISTRICT

Cold weather during the last week has interfered with operations of the large companies, especially the Boston & Montana, the ore of which is transported 183 miles for reduction. With a few exceptions, all of the heavy producers were closed down Jan. 11, and kept closed until Jan. 15, the weather having moderated sufficiently to permit of resumption. All of the wet ore, when exposed to the cold, became a solid mass of rock and could not be drawn from the bins. Where it was possible, mining was conducted in the upper levels in which the ore is dry. In addition to congealing moisture in the ore from the lower levels, another shortage of cars occurred and the companies had difficulty in shipping their dry ore. Boston & Montana suffered more than any in this line, and was compelled to close two of its five furnaces in the smelter. It has not yet placed them in commission, and may have to close one or two of the others. It is short of coal at both its mines and plant, and its supply of coke at the latter is about exhausted. It has 100 tons en route from Duluth, and 75 from Fernie, B. C., but the Great Northern Railroad Company has given notice that it is impossible to move trains under existing conditions. Washoe is receiving only two-thirds of the usual ore supply.

Bullwhacker—Patrick Clark, head of this company, announces that the workings of the property abandoned by lessees recently on account of the expiration of the lease contain at least $500,000 worth of ore, and that the company will build a 500-ton leaching plant during the coming summer to treat it. The vein at a depth of 50 ft., he says, is 90 ft. wide, 16 ft. of which carries 6 and 7 per cent. copper, while the remainder averages 4 per cent. A cross-cut has been driven from the 200-ft. station of the main shaft in the direction of this body of ore, and while the southeast end of the opening is in ore, the vein is not the one opened by the lessees 135 ft. east of the main shaft. The ore of Bullwhacker is silicate of copper and cannot be concentrated. The property is directly east of the main workings of the Pittsburg & Montana, about 1200 ft. separating the main workings of both.

Butte & Summit Valley—This company, financed by Boston men, is exploring its ground with a diamond drill, which is working from a depth of 250 ft. in the Saratoga. The work is going on under the direction of H. H. Taft, of Denver.

Reins Copper—The company will drive an opening into Ella ground, which it bought recently, from the 1200-ft. workings of its old possessions and tap the body of water in the 600-ft. shaft on the Ella with a diamond drill. After the old shaft drains, the 600 ft. between the bottom of the Ella shaft and the 1200-ft. opening will be raised out, thus affording an outlet for the men working in the lower levels of the Reins in case of accident. There are two veins in Ella ground. Both will be cross-cut and explored after the other work is finished.

East Butte—Shaft No. I is 650 ft. deep and the one on No. II is 330. The former is going 800 ft., but at 400 the two will be connected by a cross-cut. F. M. Sullivan, president of the company, reports an 8-ft. vein of first-class ore on the 400-ft. level of No. I, adding that the present showing in the property is better than it has been at any time since the company began operations. The vein has an east and west course, and is better in the west drift than in the east. The company is still receiving revenue from various sets of lessees, who are working in all of the openings outside of the two main shafts.

NEVADA

ESMERALDA COUNTY—GOLDFIELD

Hayes-Monnette—This famous lease on the Mohawk mine expired at noon on Jan. 11. The miners continued at work until the last moment. During the 24 hours before the ending of the lease 300 tons of ore were hoisted from the bonanza, which averaged $250 per ton. During the previous fortnight over $800,000 worth of ore was taken from the ground and forwarded to San Francisco for treatment.

Waverly—A body of high-grade ore has been opened up in the Gold Coin claim in a crosscut from the 50-ft. level. The shaft will be sunk to the 300-ft. level with all speed. The company also owns a lease on the C. O. D. claim and has commenced sinking on it.

Simmerone—Several small quartz veins have been cut in the shaft at a depth of 100 ft. Assay values up to $15 per ton have been obtained. In the surface workings some rich shoots were profitably worked and the new find is most encouraging. The quartz carries sulphides and the ore resembles the Mohawk ore. A valuable find may be expected at any time as the lower workings progress.

St. Ives—The Codd Leasing Company has re-started its operations on the St. Ives and is working three shifts. Before the mine was closed through the miners' strike a vein assaying $100 per ton was cut. This will be developed vigorously. Work will also be undertaken by the company on the 350-ft. level.

Esmeralda—The four new shafts on this property are being sunk in record time under the management of M. T. Monnette. There are persistent rumors of a find in the deepest shaft. The shafts are being sunk with the view of developing the famous Mohawk vein which is believed to traverse the Esmeralda leases.

Tule Cañon—A group of copper claims is being developed by the Venture Corporation, of London and New York. About a dozen men are employed. There appears to be some difficulty about the title to the claims and legal proceedings are threatened by some Goldfield prospectors, who claim to have located and secured title to the ground in the early part of last year.

NYE COUNTY—BULLFROG

Midas—The new hoist has been started and will greatly facilitate sinking. Two shifts will be employed in sinking the shaft to the 500-ft. level. It is on the vein, which is mineralized throughout.

Venture—This mine has been developed to a depth of 65 ft., and the vein has been proved by trenching for a length of 3000 ft. on the surface. In a number of places good values have been found. It is expected to develop into a large moderate-grade milling property.

Ziegler—A tunnel is being run in the Pearl Hart claim. On the Ziegler claim a quartz vein 15 ft. in width assaying up to $30 per ton is being sunk on.

Original—Active sinking operations are in progress and the shaft has now reached a depth of 370 ft. It will be continued to the 400-ft. level before crosscutting is undertaken.

Steinway—The northeast drift is in 260 ft. and the southwest 280 ft. Numerous quartz and talc streaks have been met with in the northeast drift and Superintendent Wilson is of opinion that the workings are rapidly approaching an orebody. The southwest drift is being run to intercept the Pilot vein. It will require to be run 40 to 50 ft. farther before getting into the line of strike.

Tramp Extension — A promising vein over 4 ft. in width, having all the characteristics of the Tramp vein, has been cut in the main workings. This has encouraged the owners to more vigorously push development work, and it is proposed to continue the sinking of the shaft on the Anglo-American claim and to drift for the Hobo vein, which is also believed to traverse the leases.

Alliance—The vein at the bottom of the shaft at a depth of 200 ft. is looking well. A new hoist has arrived and will be erected as soon as possible, so that the shaft can be sunk to the 500-ft. level to enable drifting to be undertaken on the vein.

NYE COUNTY—MANHATTAN

Zanzibar—The driving of the main tunnel is being continued and the Consolidated vein, which was tapped therein several weeks ago, is opening up well. Gold values average about $25 per ton, but the vein in places is seamed with high-grade ore.

NYE COUNTY—KLONDYKE

New Klondyke—At a depth of 50 ft. in the incline shaft a 6½-ft. ledge has been cut which assays high. Ore is being sacked for shipment. The mine is situated

15 miles southeast of Tonopah and is attracting a considerable amount of attention on account of the excellent showings in the workings. The company has been operating for several years and has obtained several shipments of rich ore from the mine, but the shoots were small. The new find comprises well defined quartz vein, giving promise of permanency. Many locations have been made in the vicinity of the company's buildings, and the find will result in the development of much new ground.

Manhattan Combination—The ledge is being thoroughly exploited with satisfactory results. A large tonnage of high-grade ore has been developed and the mine promises to become one of the greatest producers in the field. When milling facilities are provided, the management promises to furnish some ore that will yield sensational returns.

Paymaster—This mine, situated in the western end of the field, is developing well. Several veins have been opened up and all carry ore of milling grade, while in parts of the workings some very rich shoots have been cut. Some quartz has recently been sacked that averages over $400 per ton.

NYE COUNTY—TONOPAH

Montana-Midway Extension—The shaft has been sunk to a depth of 630 ft, and crosscuts have been run east and west for a distance of 50 ft. in each direction. The formation has changed and numerous quartz stringers have been cut, indicating the proximity of a large quartz body. The crosscuts will be continued farther with the view of intersecting one of the Midway ledges.

Cash Boy—A station is being cut at the 500-ft. level and preparations are being made to start a long crosscut. The workings are making over 12,000 gal. of water per day, and steps are being taken to improve the pumping capacity before continuing to sink the shaft to the 600-ft. level.

MacNamara—Two shifts are employed and development work is being pursued in all parts of the mine, preparatory to producing a large output when milling and transportation facilities are improved. The ledge is opening up remarkably well.

Ore Shipments—Shipments of ore from Tonopah for the week ending Jan. 10 were: Tonopah Company, 500 tons; Tonopah Extension, 325; total, 825 tons. In addition 1770 tons were shipped from Goldfield, making 2595 tons in all. The light shipments were due to the closing down of plants on account of scarcity of fuel.

NEW MEXICO

GRANT COUNTY

Silver City has just had a significant visit from some of the most important copper-mining men of the United States, including W. C. Greene, Sonora, Mexico, Dr. James Douglas, and others who are well known.

Several big deals have been consummated, and there are others now under consideration. The Tyrone Development Company, in which Col. Greene and Mr. Cole are largely interested, has purchased a group of 10 claims about a mile north of the Robinson group and adjoining the Top mine for $125,000 cash. The Robinson is a property owned by Judge W. C. Porterfield and associates, and some strikes of high-grade copper ore have lately been made in the workings. The Austin group is also under Judge Porterfield's control.

Lost Bullion Spanish Mine—An old shaft which was sunk by a prospector in 1875 and is now included in the holdings of the company has a vein from 6 to 8 ft. wide averaging in value from $30 to $40 per ton. This shaft is 75 ft. deep and a drift of 50 ft. along the vein shows good values all the way. A large dump has been found on another portion of the old property. It indicates the location of one of the main workings of the property in ancient times and is now entirely overgrown with trees and brushes. The bulk of the dump is now being systematically sampled by cuts and shafts. In the western part of the workings of the old mine a new ledge of highly ferruginous quartz has been struck which assays high in gold and silver. The company is now consulting with an engineer for the erection of a modern treatment plant of a daily capacity of 500 tons, and W. E. Wilson, president of the company, has just finished a visit to the property.

Chloride Flat—A deal of importance has been consummated in this district. An old property which has lain dormant since 1893 has been purchased by Eastern parties, who are now actively engaged in shipping ore which nets $10 per ton above shipment and treatment charges.

SOCORRO COUNTY

Mogollon District—Both Cooney and Mogollon camps are short of machine men. In the Cooney mine important new orebodies are being opened, and the force at both mine and mill is being augmented by Manager T. J. Curran of the owning company, the Mogollan Gold and Copper.

Rosedale—The gold mine and mill here, 26 miles west of Magdalena in the San Matias range, is now closed, pending a sale. The mine is opened with 50-ft. levels, from a shaft, to a depth of 700 ft. on a nearly vertical shoot of quartz, some 10 ft. thick by 180 ft. long. Another blind shoot has been found by drifting south on the 500-ft. level, that appears to be of the same size and quality and will probably join the discovery shoot in depth. The ore is gold, with a little hematite in quartz and runs about $9 a ton, of which half can be caught on the plates. There is a 10-stamp mill of 18 tons daily capacity. The cyanide plant, erected to treat the tailings, made an imperfect saving, owing probably to lack of fine sliming.

Magdalena District—The Graphic Company, after drifting, without result, for some 500 ft. north and south from the intersection of the Waldo adit with the Silver Pipe limestone, has at last been rewarded. The body struck is 40 ft. thick and, it is hoped, will prove to be on development the largest zinc deposit yet found in the camp. Much of it assays 42 per cent. zinc with scarcely any lead.

J. A. Traylor (of the Traylor Engineering Company), with New York associates, has bought control of the Tribullion company (owner of the Kelly mine) and has placed $350,000 cash in the treasury for extensions. The new three-compartment shaft on the Silver Peg claim is now down over 200 ft. and the first station is cut. The 15-drill air compressor and first-motion steam hoist ordered for this shaft will inaugurate a new era for Kelly mining practice, when they are installed.

It is planned to locate the new Tribullion smelter at Albuquerque on a site donated by real-estate men there. Competitive rates can be secured that will enable slack coal to be delivered at $1 a ton, as the town is centrally located to the Gallup, Cerrillos and Carthage coal districts. The smelter will comprise an oxide department and a spelter department; also lead and copper smelting furnaces.

The Kelly mine has been shipping recently two classes of sulphides, A and B. The A class runs 20 to 25 zinc and 8 to 12 per cent. lead, while B class has only 2 of lead but 35 per cent. zinc. The contract for the extraction of this ore has been held by A. O. Jacobsen & Co., but it expired Jan. 1.

Superintendent Davis has now taken a lease and bond on four adjoining patented claims to utilize the organization and machinery equipment of the Jacobsens, now existing in Kelly. Of these the Juanita has been worked steadily on a small scale for 20 years, and the Juanita Extension has a 150-ft. shaft in which one small but rich orebody was found. The other two claims, however, the Companion and the North Companion, have as yet shown no ore and their systematic exploration will be watched with interest.

NEW YORK

ST. LAWRENCE COUNTY

Benson Mines Company—This new company has leased the property of the Magnetic Iron Ore Company, at Benson Mines, which includes about 2800 acres of land with a concentrating plant. It has also acquired mineral rights on adjoining lands. The Benson ore is a magnetite ranging from 35 to 45 per cent. iron and low in phosphorus. When the Magnetic

Ore Company was working, several years ago, concentrates were made, carrying 60 to 65 per cent. iron, 1.5 manganese and 0.5 sulphur. The lessee will begin operations at once. The Benson Mines Company has a paid-in capital of $200,000 with John C. Eden as president and Wayne Wills, vice-president. The directors are Alexis W. Thompson, John C. Eden, Wayne Wills, E. N. Ohl and Henry Cassel, several of them being connected with the Inland Steel Company. The post office address of the company is Benson Mines, St. Lawrence county, New York.

OREGON

BAKER COUNTY

Bourne Camp—It is understood that negotiations are in progress for the consolidation of the Columbia, the Eureka & Excelsior, the Golconda and the North Pole mines. H. G. Hendryx, of Portland, Oregon, is managing the deal. Bourne is eight miles from Sumpter and 30 miles west of Baker City.

Highland Gold Mines Company—A conference was held recently in Baker City between representatives of the stockholders and Receiver Otto Herlocker. It is understood that a plan for settling the debts of the company was arranged.

PENNSYLVANIA

BITUMINOUS COAL

Consolidated Connellsville Coke Company—This company has been organized to take over all the properties of the Southern Connellsville Coke Company, the Sterling Coal and Coke Company and the Masontown Coal and Coke Company. The new company will control about 2000 acres of Connellsville coking coal, 500 acres of surface and more than 1000 ovens. The new organization is composed of men from Fayette county, Pittsburg, Boston and Cleveland. The paid up capital is stated at $1,000,000. The properties of the new company are already in active operation. The officers are: President, W. C. Magee, Pittsburg; vice-president and general manager, George Whyel, Uniontown; secretary and treasurer, I. W. Semans, Uniontown.

Monongahela River Consolidated Coal and Coke Company—This company's statement for the year ended Oct. 31, 1906, shows net earnings of $2,286,336. The charges were: Royalty on coal mined, $442,932; interest and taxes, $683,842; maintenance and depreciation of river craft, $706,962; total, $1,833,736, leaving a balance of $452,600; from this dividends of $450,000, or 4½ per cent. on the preferred stock, were paid, leaving a surplus of $2600. The net reduction in floating debt was $952,031. The production of coal for the year was 6,509,737 tons, an increase of 1,578,674 tons, or 31 per cent., over 1905. In addition, the controlled Ohio Valley Company mined 127,399 tons. The company has sold the stock which it held in the Corona Coal Company, finding the properties in Alabama could not be operated to advantage in connection with the properties in Pennsylvania.

SOUTH DAKOTA

CUSTER COUNTY

St. Elmo—While doing assessment work a rich streak of quartz was found, and, the stringer being followed, a 5-ft. ledge carrying panning values on the surface was uncovered. It was stripped for a distance of 100 ft., maintaining its values for that length. A force of men will be put to work to develop this new find.

LAWRENCE COUNTY

Hercules—Preparations are being made to resume work soon on this property in Ruby gulch. A compartment shaft, now 200 ft. deep, will be sunk to the greater depth for the purpose of encountering the ore deposits which lie below.

Cleopatra—R. B. Hughes, superintendent, is working a force of men in an old tunnel already 1200 ft. in length. The vein has been followed for a distance of 50 ft., and work is being carried on to locate the orebody lost a few years ago by reason of a fault in the formation.

Gilt Edge Maid—R. N. Ogden, a Deadwood attorney, has been appointed secretary and general manager to succeed John R. Wilson, who died suddenly a week ago. Mr. Ogden is a large stockholder in the company, has been identified with mining interests in the hills for a number of years, and is thoroughly familiar with all conditions.

Golden Placer—This company granted the eight-hour day to all of its employees the first of the year, and is consequently pushing work rapidly on its new mill. The two buildings are approaching completion, and will be in condition to operate within a few weeks.

Cobalt—Cobalt ore is said to have been discovered on the Boswald property, a mile east of Portland in the Bald Mountain district. Some samples of ore were taken from the dump, supposed to contain lead ore, but on being assayed at the Homestake office they showed a percentage of cobalt. Larger samples will be taken and further analysis made.

TEXAS

BOWIE COUNTY

Carbondale Coal Company—This company, which owns coal property near Simms, has, according to a report in the *Manufacturers' Record*, of Baltimore, expended about $150,000 for improvements and is at present mining at the rate of three cars per day. Leases on more than 3000 acres of land are said to have been secured, from which it is expected about 30,000,000 tons of coal can be produced, the product being a hard cannel coal with good power-producing qualities. The vein is said to be about 150 ft. underground, covered with a layer of slate, then a vein of soft coal, beneath which the cannel coal exists in a vein from 13 to 15 ft. in thickness. The company has constructed a standard-gage railroad four miles in length from the mines to Carbondale. It is also said to be arranging for the installation of a briquetting plant with a view to manufacturing coal briquettes. Officers of the company are J. B. Schmidtz, Denton, Texas, president; J. W. Ripy, of Fort Worth, Tex., first vice-president; I. B. Walker, Dallas, Tex., second vice-president; C. T. Ramsdale, Denton, Tex., secretary-treasurer.

UTAH

BEAVER COUNTY

Cedar Mining Company—Recently, on the 250-ft. level of this company's property a new vein containing rich gold ore was encountered. For some time shipments of high-grade lead-silver ore have been made.

Newhouse Mines and Smelters—The mill belonging to this property at Newhouse is turning out concentrates at the rate of two carloads a day. The work of enlarging the mill is in progress. The plant is to be doubled in size.

Talisman—Two new veins have recently been developed in this company's property. On the 200-ft. level 2½ ft. of lead-silver-copper ore has been exposed, 18 in. of which shows high-grade values. The other find was on the 80-ft. level in the southern part of the property.

JUAB COUNTY

Lower Mammoth—Connections between the workings on the 1700 level of this property have been effected, exposing ore of shipping grade for a distance of 240 ft. The vein shows from 15 to 30 ft. in width.

Emerald—This company is sinking its shaft to 1000 ft. depth. It is now over 800 ft. down.

Eureka-Swansea—Jesse Knight, of Provo, has secured an option on the property of this company near Silver City. It is said it will be used as a site for the proposed smelter to be built by the Tintic Smelting Company.

Centennial Eureka—Equipment for the new 50-drill compressor to be installed at this property is being assembled.

Tintic Ore Shipments—Ajax, 4 cars; Beck Tunnel, 10; Bullion Beck, 4; Carisa, 7; Centennial Eureka, 4; Eagle & Blue Bell, 7; Eureka Hill, 1; Gemini, 10; May Day, 4; Ridge & Valley, 2; Scranton, 5; South Swansea, 1; Swansea, 5; Tintic Iron, 10; Uncle Sam, 4; Yankee Consolidated, 2 cars

WASHINGTON

WHATCOM COUNTY

Whatcom County Miners' Association—At a meeting held in Bellingham, Jan. 9, the officers elected were: President, Wil-

liam Cox; vice-president, F. M. Lewis; secretary, Phil Bardon; treasurer, John M. Schurr. These officers and the following members comprise the board of trustees: John Siegfried, R. L. Kline, J. J. Noethe and A. T. Raycraft. A committee was appointed to arrange for affiliation with the State association.

WEST VIRGINIA

Fairmont Coal Company—This company's statement for 1906 shows net earnings over fixed charges, $1,017,708; dividends received, $94,500; total, $1,112,208. Depreciation amounted to $40,628, leaving a surplus of $1,071,580. From this a dividend of 3 per cent. was declared on the stock.

Foreign Mining News

CANADA

BRITISH COLUMBIA

British Columbia Copper Company—A plan for an increase in the capital stock of this company from $2,000,000 to $3,000,000 has been sent to the stockholders by President F. L. Underwood, with the announcement that the directors have already given approval to the measure, which has as its chief object the refunding of the large expenditures already made for extensions and improvements at the mines and smelter of the company and to supply additional working capital called for by the increased business.

The increase recommended is of 200,000 shares of a par value of $5 each, and of this amount 116,160 shares, or $580,800, will be offered to stockholders at par. The directors have agreed to take all of the stock not subscribed by the shareholders. The new stock, if approved, will be offered to stockholders of record Feb. 20 for subscription to the amount of 30 per cent. of their holdings, of which $2.50, or one-half, will be payable March 11 and the balance May 10 next.

ONTARIO—COBALT DISTRICT

Gamey—This Cobalt claim of 40 acres, lying north of the Buffalo, in which E. E. Dennis of Grand Rapids has the controlling interest, is to be extensively developed under the direction of Albert C. Houghton, consulting engineer. Machinery, including a 60-h.p. boiler, four-drill air compressor and hoist, will be installed and a force of about 45 men engaged. It is proposed to continue the shaft to the 100-ft. level and drift both ways at 50 and 100 ft. down and run a cross-cut at the latter depth.

AFRICA

TRANSVAAL

The actual production of gold reported in December was 550,167 oz., being 16,794 oz. more than in November, and 118,573 oz. more than in December, 1905. For the full year the total was: Witwatersrand, 5,559,534 oz. fine gold: outside districts, 227,083; total, 5,786,617 oz., or $119,609,373. This is an increase of 889,396 oz., or 18.2 per cent., over 1905. Of this gain 853,101 oz. was from the Witwatersrand, and 36,295 oz. from the outside districts.

Coal Trade Review

NEW YORK, Jan. 23

The coal trade in the West has been enlivened by cold weather, causing an increase in demand. The complaints of car shortage still continue, but it is to be noted that the supply at all the large consuming centers has been quite sufficient to meet the extra demands of the past week. The chief effect of the weather has been to make prices firm; it has not advanced them.

In the East both anthracite and bituminous trades remain quiet. A cold spell this week was too brief to have any serious effect on trade. The demand for steam coals continues large.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to Jan. 12 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite	170,088	163,302 D.	6,786
Bituminous	1,276,748	1,302,127 I.	25,379
Coke	471,975	478,526 I.	6,551
Total	1,918,811	1,943,955 I.	25,144

The daily average was 147,601 tons in 1906, and 161,996 tons in 1907; an increase of 14,395 tons.

New York Jan. 23

ANTHRACITE

Hard-coal dealers are still averse to placing any orders while the weather continues mild, and the dullness which has characterized the anthracite market for several weeks continues unabated. Last year at this time, although the weather was similar, there was considerable activity during January, February and March owing to the fact that a strike was imminent; but this year no such contingency has to be met, and dealers, who ordinarily would think nothing of giving an order for several thousand tons, are content to order 900 or 1000 tons. Unless a decided cold spell occurs, there is little prospect of activity. Cars are in fair supply, and the number could probably be readily increased, should the demand warrant it. The production at the mines is naturally curtailed, and the first sizes to be affected as to quantity are the small steam sizes, and these are very scarce in the local market. Prices remain at $4.75 for broken, $5 for egg, stove and chestnut. Small steam sizes are $3 for pea, $2.25@2.50 for buckwheat; $1.50 for rice; $1.40 for barley; all f.o.b. New York harbor shipping points.

BITUMINOUS

The Atlantic Seaboard soft-coal trade shows little change, and the demand is generally good, though here and there trade is quiet. This has been brought about by the comparatively good weather, which has permitted regular shipments from the mines to come forward to consumers. Car supply to individual operators has continued good since the beginning of the year, which was also a helpful feature in the market.

Trade in the far East is good, and this territory has absorbed its full quota. Trade along the Sound is better to a small degree, and discharging has been facilitated, which has permitted more coal to go forward to that territory. New York harbor trade is quiet, with coal of various qualities being offered. This has not changed prices to any extent, though it has produced more or less weakness, which cold weather will probably correct. Fair grades of steam coal are bringing about $2.75 f.o.b. New York harbor shipping points.

All-rail trade is easier, although consumers are taking on considerable coal, as they do not care to let their stocks fall behind to any extent. Transportation from mines to tide has improved, coal running through in a little less than schedule time. In the coastwise vessel market vessels are in fair supply, and freight rates continue the same. We quote from Philadelphia to Boston, Salem and Portland, 95c.@$1, and discharge, on large vessels; the loading and discharging clause is included.

Birmingham Jan. 21

Coal operations in Alabama show some improvement, as the railroads begin to supply more cars. There is no hold-up in the demand, and strong prices still prevail. State Mine Inspector J. M. Gray has not received enough figures as yet to give out positive information as to the coal production in this State for the past year.

G. B. Crowe and associates have purchased the coal properties and coke ovens of the Connellsville Coal and Coke Company, in the lower part of Jefferson county, paying $50,000 for 2300 acres of land. The property will be developed at once, more coke ovens constructed and coke manufactured. Dr. Crowe and associates now operate the mines at Yolande, in Tuskaloosa county, not far from the Connellsville property.

Edward Flynn, president of the Alabama district organization of the United Mine Workers of America, has been appointed assistant State mine inspector, to take office Feb. 1, *vice* M. M. Kuffner, resigned to take a position with the Davis Creek Coal Company. Mr. Flynn is a practical coal miner. He will resign his position with the mine workers as soon as his commission comes from the governor.

Chicago Jan. 21

In consequence of extraordinarily mild weather, the demand for all grades of bituminous and anthracite coal has fallen off greatly. The cold weather that began Sunday may aid the trade greatly; but the indications are not favorable to continued cold weather over Chicago territory, and the present over-supply and light demand will probably continue. Nearly all grades of coal are lower in quotation, while the amount of coal received continues, through favorable transportation and increased facilities at the mines, to increase.

Illinois and Indiana, as constituting the great bulk of the local market, determine the quotations. Prepared sizes from the mines of these two States are decidedly easier; the operators, preparing for a mild winter, have caused an over-supply of lump and egg, so that the product is disposed of with difficulty. Lump and egg from Illinois and Indiana mines sell for $1.85@3; run-of-mine for $1.80@2.50 and screenings for $1.25@1.50. In general it may be said that these coals are off 10 to 50c., on account of the weather chiefly.

Eastern coals are likewise depressed. Smokeless, the steadiest, brings 20 to 30c. less than the standard quotations of $3.40 for run-of-mine and $4.30 for lump. Hocking is in over-supply and brings 40 to 65c. less than the standard quotation of $3.65. Youghiogheny is selling at about $3, with the supply large.

Cleveland Jan. 22

The coal trade improved when the cold wave settled over this territory on Sunday and Monday. Stocks on hand are so liberal, however, there has been little need for anyone to worry about supply, and it will take several days for the market to get rid of the surplus, and for the colder weather to have any influence on prices. The only result, therefore, from a trade standpoint, was the elimination of sales in the nature of sacrifice to avoid car-service charges. The market has strengthened in tone without any real change in prices.

The best grades of mine-run coal are selling on the basis of $1.15 at mines for Ohio; $1.10 for No. 8, and $1.10@1.15 for Pennsylvania. The supply of slack has been so short some of the users of stoking devices have been forced to use mine-run coal, breaking it up with hammers and crushers to the size needed. Ohio slack is selling on the basis of $1.10 at mines, and Pennsylvania slack 85@90c. at the mines. The colder weather has also stiffened the demand for strictly domestic coal, especially since the pressure of natural gas has not been strong enough to satisfy the demands. The prices in that market have not changed, being based on $2.30 at mines, for Massillon.

The coke market is stronger and the blizzard is giving further improvement to the tone of the market. The best grades of 72-hour foundry coke are selling on the basis of $4.25 at ovens, and furnace coke $3.50@3.60 at ovens.

Hartshorne, Ind. Ter. Jan. 19

The car shortage in the Southwest still continues, but the warm weather prevailing for the past two weeks, together with the extra efforts put forth by the railroads, has made the situation a little easier and prevented any actual suffering. The demand for coal, however, has not abated.

Pittsburg Jan. 22

Coal—There was a slump in coal prices last week, caused by cutting on the part of small operators. The mild weather of the past few weeks was responsible for a falling off in orders, and besides there was an unusually good supply of railroad cars. The leading interest, although it had enough cars to serve its mines to capacity, did not operate to more than 80 per cent. The severe cold weather which opened the week is expected to increase the demand and restore former prices. Sales have been made on the basis of $1.10 @1.20 for mine-run coal at the mine. The mines of the Monongahela River Consolidated Coal and Coke Company have been prevented from operating full on account of the high water in the river, it being impossible to handle empty craft. When the waters recede a good boating stage will enable shippers to send several large tows to lower ports.

Connellsville Coke—The coke market continues strong, but there is no change in prices. Furnace coke for January and February shipment is quoted at $3.40@3.50 and foundry remains at $4@4.25. According to the *Courier* the production for the week amounted to 292,673 tons. The shipments aggregated 15,252 cars, distributed as follows: To Pittsburg, 4575 cars; to points west of Pittsburg, 8792 cars; to points east of Connellsville, 1885 cars.

Foreign Coal Trade

Jan. 23

The quantity of coal bunkered, or furnished as fuel, to steamships engaged in foreign trade at United States ports for the 11 months ending Nov. 30, 1906, was 4,712,087 tons. Adding this to the exports, previously reported, makes a total of 13,826,758 tons sent beyond the limits of the United States.

Exports of fuel from Great Britain, with coal sent abroad for the use of steamers engaged in foreign trade, were as follows for the year ended Dec. 31, in long tons:

	1905.	1906.	Changes.
Coal	47,476,707	55,599,771	I. 8,123,064
Coke	774,110	815,224	I. 41,114
Briquets	1,108,455	1,377,219	I. 268,764
Total exports	49 359,272	57,792,204	I. 8,432,932
Steamer coal	17,396,144	18,590,213	I. 1,194,067
Total	66,755,416	76,382,417	I. 9,626,999

This shows a total increase of 14.4 per cent. in coal sent beyond the limits of the United Kingdom. Exports to the United States, included above, were:

	1905.	1906.	Changes.
Atlantic ports	86,609	25,438	D. 31,171
Pacific ports	75,160	30,741	D. 44,419
Total	131,769	56,170	D. 75,590

The larger exports in 1906 were 9,444,528 tons to France; 7,810,024 tons to Italy; 7,629,653 tons to Germany; 3,573,505 tons to Sweden.

Exports of coal from Germany for the 11 months ended Nov. 30 were, in metric tons:

	1905.	1906.	Changes.
Coal	16,446,517	17,975,884	I. 1,529,367
Brown coal	18,423	16,837	D. 1,586
Total	16,464,940	17,992,721	I. 1,527,781

Exports of coke for the nine months March—November, 1906, were 2,596,106 tons. Included in these were 15,529 tons to the United States.

Imports of coal into Germany for the 11 months were, in metric tons:

	1905.	1906.	Changes.
Coal	8,614,287	8,355,056	D. 259,231
Brown coal	7,176,868	7,764,865	I. 587,997
Total	15,791,155	16,119,921	I. 328,766

Imports of coke for the nine months March—November, 1906, were 417,135 tons; of briquets, 127,104 tons.

Dusseldorf, Germany Jan. 12

The coal production of the German Empire for the 11 months ending Nov. 30 is reported as below, in metric tons:

	1905.	1906.	Changes.
Coal	110,672,797	125,693,158	I. 15,020,361
Brown coal	47,256,651	51,329,874	I. 4,073,223
Total mined	157,929,448	177,023,032	I. 19,093,584
Coke made	13,878,482	18,475,721	I. 4,597,239
Briquets made	11,748,721	13,345,283	I. 1,596,562

The total increase in coal mined was 12.1 per cent. The briquets made are largely from brown coal, or lignite.

Iron Trade Review

NEW YORK, Jan. 23

Strong buying of pig iron is still in evidence, and the movement started last week has not yet subsided. Consumers seem to have made up their minds to secure their supplies by contract, and so guard themselves against any possible difficulty in getting supplies when needed.

In finished material there has been comparative quiet, with few new orders. The mills are being pressed for deliveries on contracts, and are all busy. Some structural business is still coming forward, but more is held back, on account of the difficulty in getting early deliveries. Steel billets are not as active as they have been, but are still in strong demand, as are sheet-bars. Bars, both iron and steel, are strong, with little spot material. Lake ship builders and steel-car builders are responsible for sold-up conditions in plates and shapes.

Car shortage worries mills and furnaces,

and conditions do not seem to be improving to any great extent. The Southern furnaces are suffering most, and cannot move their iron as fast as they make it.

Ore sales are practically completed for the season, though a little is being bought from the Lake Erie dock stocks.

Baltimore Jan. 22

Imports for the week included 310 tons spiegeleisen and 456 tons ferro-manganese. Receipts of iron ore were two cargoes, 9350 tons, from Cuba.

Included in the exports were 749 tons steel billets; also 29,317 lb. zinc dross.

Birmingham Jan. 21

The improvement in transportation has not been at such a rate as to bring a great amount of satisfaction. The shipments this month are somewhat better than they were in December, but not much. The accumulated stocks of iron will not show as big a reduction at the end of the month as was hoped. Manufacturers or consumers will have to pay the 25c. advance in freight rates, which goes into effect Feb. 1, on a large tonnage of iron. The sale of iron for delivery during the last half of the year is still steady and inquiries that are coming this way indicate that much iron is yet needed. The quotations remain firm. No. 2 foundry, for delivery during the last half of the year, is bringing $18.50@19. Iron for the first quarter is very hard to find. Second-quarter pig is not so plentiful, though some is to be had. The price for second-quarter iron is still above $20, No. 2 foundry.

The Shelby Iron Company is making preparations to blow in one of its furnaces about the first of the coming month; charcoal is being collected now.

The Tennessee Coal, Iron and Railroad Company has sold its probable make in steel rails for the entire year. There is a good inquiry being received for steel and steel products, with all plants in full operation. Cast-iron pipe, soil pipe and other products are in strong demand, and good prices obtain. Labor is still scarce.

Chicago Jan. 21

The last week has been one of strong trading and advancing quotations for Northern pig iron, with Southern fully holding its own. Melters seem to be coming to the point where they are willing to contract heavily for future demands, and the spot iron clamor is becoming fainter. The great demand now is for iron on contracts for the third and fourth quarters of the year.

Everybody in this market expects a January lull, but this is past, for 1907, to all appearances. The year opened with the usual diffidence of buyers. They thought there were possibilities of a lower market and of business disturbances that would cause the unexpected to happen. The unexpected did not happen. Prices remained firm and need has steadily increased. In consequence, the market is the strongest that has been known for many Januaries, and bids fair to grow stronger.

Quotations are variable, but the following represent a fair average and presentation of the market as it stands today, for deliveries in the last half of 1907: Lake Superior charcoal, $25.50@26.50; Northern No. 2, $25@26; Southern No. 2, $25.35@26.35 ($21@22 Birmingham). On deliveries in the second quarter prices are $1@2 lower.

All indications are for a greater year than 1906, so far as the consumption of iron locally is concerned. The sale of finished materials is very strong and increasing.

Coke is active with increasing demand, and Connellsville bringing $6.65 Chicago, or $4 at ovens.

Cleveland Jan. 22

Iron Ore—An estimate has been made that the shippers of iron ore own or have under charter enough boats to bring down the lakes 36,000,000 tons of iron ore during the coming season. It is estimated that the fleets owned by the producers will move 20,000,000 tons, and that the merchant fleets chartered have a carrying capacity of 16,000,000 tons. Provided the movement by lake is 40,000,000 tons there will be, for carriage in wild boats, about 4,000,000 tons. It is anticipated the movement will not be less than the figure outlined and possibilities are it will be much larger. Sales of ore are light, sales off stock piles being almost nil. This may be heavier, this year, than for a number of years, however, owing to the desire of some consumers to get a portion of the high-grade ores remaining on the stock piles here for years.

Pig Iron—Producers of foundry iron are compelled to cut down shipments because production is reduced, first by low-grade ores, and second by necessity to make repairs to furnaces. The demand is still strong, the surplus being cared for by imports. A good deal of foreign iron is coming into this territory, and most of it is sold before it reaches this market. The price is $26 delivered. On future delivery the demand is still good. Consumers are trying to hammer prices, and this gives rise to many reports of weakness. The market is really strong, with $22 at furnace the minimum, and some of the furnaces selling their output as high as $24 at furnace. Bessemer has been stiffened just a little by sales at $21.50 for large amounts. Basic is holding firm on the same basis. Southern furnaces are not able to sell in this territory for first half, owing partly to congested conditions at the furnaces and partly to lack of transportation facilities. Their spot price is $23 Birmingham for No. 2, while $18@19 is asked for second-half delivery.

Finished Material—Interest continues to center in the supply of semi-finished material. It may be said both billets and sheet-bars are easier. This is particularly true of re-rolling billets. Forging quality is still hard to obtain. The demand for sheets is strong; also for bars, especially bar iron, which is selling on the basis of 1.80@1.85c. Pittsburg. The demand for structural shapes and plates is still strong, most of the specifications being in the nature of anticipation of contract requirements.

Philadelphia Jan. 23

Pig Iron—People in this territory who are taking new business calling for pig iron feel that they must buy, notwithstanding prices are higher than they think the iron is worth, or is likely to sell at later on. At least this is an expression that has been made by quite a number of consumers who have contracted for iron since last report. They see that there is nothing else to do but to make themselves safe, and they are unwilling to take any chances. Every influence at work points to still higher prices and they take very little encouragement from the intimations thrown out in some quarters that we have reached the high-water mark. Foreign iron costs almost as much as American to deliver, and there is not much relief offered at Southern furnaces. Our Pennsylvania pig-iron makers are not seeking buyers, and what little capacity they have available for the next three or four months they are conscientiously taking care of to benefit their customers. Basic iron is exceptionally strong and the only reason why big business cannot be announced this week is that the makers are not in a position to accept orders. Bessemer pig is very strong and is pointing upward. Some little business has been done in malleable iron and considerable malleable is due to consumers here, which was contracted for some little time ago. The bar-mill people are resting quietly so far as forge iron is concerned, as they have contracts which will protect them in most instances. Quotations for No. 1 X foundry may be given at about $26.50; No. 2 X, $24.50; No. 2 plain, $23.50; standard forge, $23; malleable, $26.50; basic is nominally $24; Middlesboro on dock is quoted at $23@23.50, and Scotch in the neighborhood of $25.

Steel Billets—It remains with the mill people to determine whether much business in billets will be done this week or next. The users of billets are in about the same fix as the users of pig iron and are forced to follow the same policy of buying in order to take care of the business which is coming along. Rolling billets are about $34, forging $36.

Bars—Best refined iron is moving quite freely from stores in small lots at high prices, 1.93½c., and steel bars are selling

at about the same price, though not quoted on the card at that figure.

Sheets—While the card rate is from 2.80 to 3.20c., the actual selling price on the business that is being done this week is higher.

Pipes and Tubes—Pipes and tubes are very strong and high. Conditions point to further advances in tubes.

Plates—The only quotations which have made within a week are at an advance over the supposed card rates, as the material is wanted promptly.

Structural Material—There will be a heavy demand within the next two weeks for structural material for a number of big buildings that are to be erected in this territory. There are also rumors of large transactions for railroad purposes and terminal requirements. Premium quotations are the rule and further advances are regarded as inevitable.

Steel Rails—The business for the past week has been made up altogether of small lots and light sections are being ordered more freely than for some months.

Scrap—The outcome of the frantic endeavors of the scrap-iron people to gather in material has been that there is a temporary surplus of certain kinds, but this surplus would soon be swept out of the way if the scrap men would take a little less money. They have been riding the high horse so long that they feel they can keep up these high quotations, but the indications are that they will have to change their minds.

Pittsburg Jan. 22

The iron and steel markets are decidedly dull, so far as new business is concerned, but specifications on old contracts in all finished lines continue heavy. An active pig-iron buying movement for second half had been expected when several important sales were made two weeks ago, but since that time there have been few transactions, and last week no sales of any grade of pig iron for late delivery were recorded.

All the mills in the Pittsburg district are busy, and despite the high water during the past week, little inconvenience was caused to the mills along the rivers, compared with former years. The two rivers were at a flood stage several times, but only for a few hours, and the damage to the mills was slight, and did not interfere seriously with operations. While production is not at the highest point the output for January is expected to equal that for December. Structural material seems to be a dull line, and the Carnegie Steel Company has taken advantage of it to put new engines in its 35-in. mill at the Homestead works. This mill will be running again early next week. There are inquiries for over 100,000 tons of steel rails, but so far the business has not been placed. The Carnegie company has not booked any new rail orders lately, but is operating both of its rail plants, the Edgar Thomson, at Braddock, and the Ohio works, at Youngstown, to capacity, and both will be kept busy until late in the year on contracts taken to date.

The tin-plate market is firm, and the established price of $3.90 a box for coke plates, 14x20, is being strictly observed by both the American Sheet and Tin-Plate Company, and the independent interests. Production is heavy and stocks are light. If the packers conform to the standard established by the committee of the Department of Agriculture the manufacture of tin-plate may be affected. It calls for a minimum coating of 1.8 grains on each piece 2 in. square, equal to 2 lb. 1¼ oz. a box. At present 2 lb. of tin is used in coating a box of plates. Uniform coating, however, cannot be guaranteed by the manufacturer, and to insure the coating required under the standard of the committee it would be necessary to use more tin, which would increase the price of tin-plate to the packers.

All the pipe mills are crowded with business, and new inquiries are being received that may result in contracts shortly. The Adrian Gas Company is in the market for a large tonnage of various sizes of pipe, and the order may be placed with the National Tube Company. The plate mills are booked up to the third quarter, and considerable new business is in sight. Inquiries are in for 40,000 steel cars, and if the contracts are placed will mean fully 400,000 tons of plates.

Pig Iron—The only business of importance booked this week was for delivery in the first quarter. One sale was of 500 tons of bessemer for January and February delivery at $23.85, Pittsburg, and the other, 1500 tons of gray forge for first quarter at $22.50, Pittsburg. Small lots of No. 2 foundry sold at $25, Valley furnaces. Producers are not willing to make any concessions on prices established for the second half, and consumers do not seem to be ready to buy. There is a small spread between the leading grades, with foundry the highest at $21.75, bessemer, $21.50 and basic, $21.25, all f.o.b. Valley furnaces. All the Westinghouse interests, except the Westinghouse Electric and Manufacturing Company, have covered for their second-half requirements, and it may delay buying in expectation of a lower rate.

Steel—Deliveries of billets are improving, but there is no new business. Prices remain unchanged, with bessemer billets quoted at $29.50, and open-hearth at $32@33. Plates are firm at 1.70c., and merchant steel bars at 1.60c.

Sheets—Mills cannot guarantee deliveries on new business inside of two months. Prices continue strong, black sheets being quoted at 2.60c., and galvanized at 3.65c. for No. 28 gage.

Ferro-Manganese—The market is lower, sales having been made today at $79 a ton.

London Jan. 17

Iron and Steel Exports—Exports of iron and steel, and of machinery, from Great Britain for the full year are valued by the Board of Trade returns as below:

	1905.	1906.	Changes.
Iron and Steel..	£31,826,438	£39,880,563	I. £8,054,125
Machinery.....	23,260,326	28,732,693	I. 5,472,367
New Ships.....	5,131,298	8,685,240	I. 3,553,942
Total.....	£60,218,062	£77,298,496	I. £17,080,434

The increase in the total last year was 28.4 per cent. The larger items of the iron and steel exports were, in long tons:

	1905.	1906.	Changes.
Pig iron.....	982,876	1,664,442	I. 681,566
Wrought iron.....	183,376	200,316	I. 16,940
Rails	546,569	463,240	D. 83,329
Plates.....	204,568	275,058	I. 70,490
Sheets.....	406,815	443,131	I. 36,316
Steel shapes, etc.....	213,747	275,143	I. 61,396
Tin-plates.....	354,864	375,414	I. 20,550
All other kinds.....	828,567	992,102	I. 163,535

The total increase in quantities was 967,464 tons, or 26 per cent. Exports of pig iron to the United States in 1906 were 310,699 tons, an increase of 136,810 tons; of tin-plates, 61,518 tons, a decrease of 1532 tons.

Iron and Steel Imports—Imports of iron and steel into Great Britain for the full year are valued as follows:

	1905.	1906.	Changes.
Iron and steel...	£8,589,405	£8,360,135	D. £229,270
Machinery.....	4,537,871	5,127,187	I. 589,316
Total.....	£13,127,276	£13,487,322	I. £ 360,046

The total increase was 2.7 per cent. The chief items of the iron and steel imports were, in long tons:

	1905.	1906.	Changes.
Pig iron.....	126,164	89,246	D. 36,918
Wrought iron.....	105,960	107,713	I. 1,753
Steel billets, etc.....	603,949	486,029	D. 117,920
Bars and shapes.....	50,227	55,025	I. 4,798
Structural steel.....	122,998	138,660	I. 15,662
All other kinds.....	346,700	340,043	D. 6,657

There was a total decrease in quantities of 140,282 tons, or 10.3 per cent., last year.

Iron Ore Imports—Imports of iron ore into Great Britain for the full year were, in long tons:

	1905.	1906.	Changes.
Manganiferous ores.	285,563	309,071	I. 23,508
Iron ores.....	7,059,223	7,514,015	I. 454,792
Total.	7,344,786	7,823,086	I. 478,300

Of the imports in 1906, Spain furnished 203,303 tons of manganiferous ores and 5,746,058 tons of iron ores.

Cartagena, Spain Jan. 5

Iron and Manganiferous Ores—Messrs. Barrington & Holt report for the week: Shipments were one cargo, 4000 tons dry ore, to New York; one cargo, 4450 tons, to Philadelphia; two cargoes, 6100 tons dry ore, to Great Britain; 14,550 tons in all. Since our last report there has been very little business passing, miners in most cases not having yet resumed work after their holidays. The position, however, continues highly satisfactory from the miners' point of view, the demand for every class of ore being far in excess of the production. The amount of iron ore shipped from Cartagena during 1906 was

780,439 tons, as against 530,929 tons for the previous year, while the adjacent ports in the province—Porman, Mazarron, Parazuelos and Aguilas—all show increased shipments.

We are unable to quote any prices, owing to their being apparently no ore disposable. Freight rates are a trifle easier, but tonnage still continues scarce, there being a considerable number of orders in the market for prompt boats.

Metal Market

NEW YORK, Jan. 23

Gold and Silver Exports and Imports.

At all United States Ports in December and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Dec. 1906...	$1,729,194	$ 7,588,623	Imp. $5,859 429
" 1905 .	2,668 532	4,028.881	" 1,360,349
Year 1906..	46,560,397	155,550 766	" 108.990,369
" 1905..	46,794,467	50,293,405	" 3,498,938
Silver:			
Dec. 1906...	5,486,094	4.122,324	Exp. 1,363 770
" 1905 ..	8,196,149	4,692 746	" 3 503 403
" 1906 ..	59,036,340	44,350 896	" 14,685 444
1905 ..	57,513,102	35,939,135	" 21,573,967

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York.

For week ending Jan. 19 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	$ 256,800	$ 94,036	$243,863	$ 31,189
1907.....	473,615	304,115	1,435,459	212,116
1906.....	536,000	118,926	6 385,082	185,382
1905.....	8,016,432	111,885	2,294,318	61,740

Gold exports for the week were chiefly to Argentina; silver to London. Imports, both gold and silver, for the week, were from Mexico and South America.

The foreign trade of the United States for the full year is valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1905.	1906.
Exports.....	$1,626,990,795	$1,798,107,955
Imports.....	1,179,144,550	1,321,064 694
Excess, exports....	$447,846,245	$477,043.261
Add excess of exports, silver.....		14,685,444
Total.....		$491.728,705
Deduct excess of imports, gold.....		108.990 369
Net export balance.....		$382,738,336

The gold and silver movement in detail will be found in the table at the head of this column.

The joint statement of all the banks in the New York Clearing House for the week ending Jan. 12 shows loans, $1,063,957,200, an increase of $15,148,000; deposits, $1,042,434.400, an increase of $33,512,000, as compared with the preceding week. Reserve account shows:

	1906.	1907.
Specie.....	$189,968,300	$192,610 600
Legal tenders.....	84,138,600	86,458,700
Total.....	$274,106,900	$279,069,300
Surplus.....	$16,764 550	$18,460,700

The surplus over legal requirements shows an increase of $9,820,000, as compared with the previous week.

Specie holdings of the leading banks of the world on Jan. 19 are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	.....	.....	$192,610,600
England.....	$160,814,120	.....	160,814 120
France.....	529,877 800	$198.167,800	728.045.600
Germany.....	151,001,500	50,333,750	201.335,250
Spain.....	76,935,000	121,005,000	197,940,000
Netherlands....	27,697,000	28,595.000	56,292,000
Belgium.....	16,383,335	8,196,665	24.580,000
Italy.....	160,980,000	23,800,500	184,780,500
Russia.....	590 255,000	23,675,000	613,930,000
Aust.-Hungary.	232,165.000	58,900,000	291,065,000
Sweden.....	19,980,000	.....	19,980,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

The movement of gold and silver in Great Britain for the full year is reported as below:

Gold:	1905.	1906.
Imports.....	£38,567,895	£46,042,090
Exports.....	30,829,842	42,617,267
Excess, imports.....	£7,738,053	£ 3,424,823
Silver:		
Imports.....	£12,992,014	£17.288.063
Exports.....	14,561,677	18,865,285
Excess, exports.....	£1,569,663	£1,577,222

Of the silver imported last year £14,890,946, or 86.1 per cent. of the total, came from the United States.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to Jan. 10:

	1905.	1906.	Changes.
India.....	£ 747,200	£33,480	D. £ 713,720
China.....	.....	.....	.....
Straits..	.....	.....	.....
Total.....	£ 747,200	£33,480	D £ 713.720

Receipts for the week were £5000 from New Zealand, £11,000 from Chile, £17,000 from the West Indies, £362,000 in coin from the Straits, £203,000 in bars and £15,700 in Mexican dollars from New York; a total of £673,700. Exports were £26,780 in bars and £6700 in Mexican dollars; £33,480, all to India.

Indian exchange is strong, and the Council bills offered in London were taken at 16.09d. per rupee. Shipments of gold from Australia to India have been small so far this year.

Prices of Foreign Coins

	Bid.	Asked
Mexican dollars.....	$0.53	$0.55
Peruvian soles and Chilean.....	0.47⅞	0.49
Victoria sovereigns.....	4.85½	4.87½
Twenty francs.	3.86	3.89
Spanish 25 pesetas...	4.78	4.80

SILVER AND STERLING EXCHANGE.

January.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	January.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
17	4.85⅛	67⅝	31¼	21	4.86	68¾	31 1/16
18	4.85⅛	67⅞	31⅜	22	4.85⅝	68	31⅜
19	4.86	67⅞	31⅝	23	4.85⅛	68⅛	31 1/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Daily Prices of Metals in New York.

January.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
17	24¾ @25	24¼ @24¾	107¼	41⅜	6.00	6.70 @6.75	6.55 @6.60
18	24¾ @25	24¼ @24¾	106½	41⅜	6.00	6.70 @6.75	6.55 @6.60
19	24¾ @25	24¼ @24¾	.....	41⅜	6.00	6.70 @6.75	6.55 @6.60
21	24¾ @25	24⅛ @24¾	106¾	41¾	6.00	6.70 @6.75	6.55 @6.60
22	24¾ @25	24⅛ @24¾	106¾	42	6.00	6.70 @6.75	6.55 @6.60
23	24¾ @25	24⅛ @24¾	106 11/16	42	6.00	6.70 @6.75	6.55 @6.60

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotation on spelter are for ordinary western brands; special brands command a premium.

Copper—Transactions have been light. Conditions in the market still remain unchanged. Prices, due to the oft reported shortage of supplies, still continue to harden, and close firm at 24¾@25c. for Lake; 24½@24¾ for electrolytic ingots, cakes and wirebars. Casting copper is nominally 24¼@24½c.

Some bear selling took place in London, and while these sales were not able to depress the standard market very much, they nevertheless had the effect of unsettling it, especially as far as spot supplies are concerned. It closes steady at £106 16s. 3d. for spot, £108 1s. 3d. for three months.

Refined and manufactured sorts we quote: English tough, £109; best selected, £114; strong sheets, £123@124.

Exports of copper from New York for the week were 2019 long tons. Our special correspondent reports the exports from Baltimore at 1126 tons of copper.

Imports of copper and copper material into Great Britain, with exports of copper, were as follows for the full year; the total imports given being the copper contents of all material, in long tons:

	1905.	1906.	Changes.
Copper ore.....	92,689	96,249	I. 3,560
Matte and precipitate...	69.129	74,875	I. 5,746
Fine copper.....	70,876	74,298	I. 3.422
Total, copper.....	114,710	121,361	I. 6,651
Re-exports	14,201	14,664	I. 463
Exports.....	52,481	42,443	D. 10,039
Total exports..	66,683	57.107	D. 9,576
Balance, imp.....	48,027	64,254	I. 16,227

Of the imports the United States furnished last year 6388 tons of matte, an increase of 1499 tons; and 26,895 tons of fine copper, a decrease of 1348 tons. Imports of matte and precipitate from Spain in 1906 were 20,328 tons, an increase of 2100 tons. Imports from Chile were 4895 tons matte and 11,742 tons copper, show-

ing decreases of 3060 and 5637 tons, respectively. Imports from Australia were 11,076 tons copper, a decrease of 1329 tons.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per lb.; subject to change without notice.

Copper Sheets—The base price of copper sheets is 30c. per lb.; subject to change without notice.

Tin—Notwithstanding the fact that the London market has become a good deal firmer and higher, buyers in this market are still holding back and business was done in retail lots only. At the close 42c. is quoted for spot tin in this market, while London closes firm at £192 for spot, £192 5s. for three months.

Tin shipments from the Straits for the first half of January are cabled as follows: United States, 634 long tons; Great Britain, 1246; European Continent, 250; total, 2130 tons. This is a decrease of 951 tons from the corresponding period last year.

Imports and exports of tin in Great Britain for the full year were as follows, in long tons:

	1905.	1906.	Changes.
Straits	33,446	35,635	I. 2,189
Australia	4,074	5,114	I. 1,040
Other Countries	2,245	2,859	I. 614
Total imports	39,765	43,608	I. 3,843
Re-exports	29,155	32,271	I. 3,116
Exports	7,623	8,495	I. 872
Total exports	36,778	40,766	I. 3,988
Balance, exp.	2,987	2,842	D. 145

The re-exports are largely of Straits tin to the United States.

Lead—The quotation remains unchanged at 6c. New York.

London, which had reported toward the end of last week a weaker market, has become a good deal stronger since the beginning of this week, and closes firm at £19 18s. 9d. for Spanish lead, £20 1s. 3d. for English lead.

Imports and exports of lead in Great Britain for the full year are reported as below, in long tons:

	1905.	1906.	Changes.
United States	24,688	18,394	D. 6,294
Spain	106,614	111,914	I. 5,300
Australia	70,504	54,272	D. 16,232
Germany	23,721	16,640	D. 7,081
Other countries	4,018	7,033	I. 3,015
Total imports	229,545	208,253	D. 21,292
Exports	41,541	44,894	I. 3,353
Balance, imports	188,004	163,359	D. 24,645

The lead credited to the United States is chiefly Mexican lead, refined here in bond.

St. Louis Lead Market—The John Wahl Commission Company telegraphs under date of Jan. 16 as follows: Lead is quiet, with sales at 6.07½c. for ordinary Missouri brands, and 6.15c. for corroding lead.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Jan. 5, that the price of pig lead has been 91.75 reales per quintal, equal, on current exchange, to £18 4s. 4d. per long ton, f.o.b. Cartagena. Silver is 14 reales per ounce; exchange, 27.44 pesetas to £1. Exports for the week were 192 tons argentiferous lead to Marseilles.

Spelter—Consumption in this metal continues at a very satisfactory rate, in consequence of which a good business has been done. Spot and near by shipments are still at a premium over more distant deliveries. The market closes firm at 6.70 @6.75 New York, 6.55@6.60 St. Louis.

Imports and exports of spelter in Great Britain for the full year were as follows, in long tons:

	1905.	1906.	Changes.
Spelter	90,808	93,704	I. 2,896
Zinc sheets, etc	21,167	19,354	D. 1,813
Total imports	111,975	113,058	I. 1,083
Exports	7,322	7,837	I. 515
Balance, imports	104,653	105,221	I. 568

Imports of zinc ores are not reported separately.

The London market, which was very weak and had declined to £26 10s., closes somewhat firmer and reports quotations as steady at £27 for good ordinaries, £27 5s. for specials.

Zinc Sheets—The base price is $8.40 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony—Quotations are unchanged. Cookson's, 25¾@26¼c.; Hallett's, 25@25¾c.; ordinary brands, 24@24½c.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum — Demand continues strong and prices high, with an upward tendency. Unmanufactured platinum is quoted at $38 per oz. For good scrap $31.50@32 is paid.

Quicksilver—There is no change. New York prices are $40.50@42 per flask of 75 lb., according to size and conditions of order. San Francisco prices are $39@40 per flask for domestic orders, and $37@38 for export trade. The London quotation is £7 per flask, with £6 18s. 9d. asked by jobbers.

Imports of quicksilver into Great Britain for the full year were 2,552,586 lb. in 1905, and 2,911,742 lb. in 1906; an increase of 359,156 lb. Re-exports of imported metal were 1,599,826 lb. in 1905, and 2,078,449 lb. in 1906; an increase of 478,623 lb. last year.

Aluminum—Prices are steady and demand good. Prices for ton lots, or over, are: No. 1, over 99 per cent. pure metal, 36c. per lb.; No. 2, over 90 per cent., 34c. Small lots are 1 to 3c. higher, according to size. Rods, according to size, are 1c. per lb. up, over the price of ingots. Granulated metal is 2c. per lb. over ingots.

Dating from Jan. 1, 1907, the name of the Pittsburg Reduction Company has been changed to the Aluminum Company of America. The change is solely one of name and is made to indicate the character of the business.

Wisconsin Ore Market

PLATTEVILLE, Jan. 19

Indications the first part of the week pointed to increased strength and activity in the zinc ore market, but no material excitement resulted. Nearly all of the operators resumed work, and the buyers were all back in the field. Two of the new plants have had their try-out runs, but no turn-in has been reported from them so far. The new roaster at the Black Hawk is ready to start. It is estimated that there are several hundred tons in their bins ready to be treated in the roaster. Interest is being shown in the output of the different camps, and it is expected that this coming spring will see a change in the shipments from some of the smaller producers, owing to the starting up of new mills. Platteville camp is bound to hold first place as the old-time producers have as bright an outlook as they ever had, and this summer will see at least three new producers in operation, the foundations being in for two plants already.

Prices remained, in general, as they were last week.

The camps of the district loaded ore as follows for the week ending Jan. 19:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur Lb.
Platteville	263,250	.....	.....
Highland	447,160	.....	.....
Linden	441,785	.....	.....
Benton	210,800	.....	.....
Mineral Point	170,550	36,600	.....
Galena	164,000	.....	.....
Cuba City	152,140	.....	.....
Total for week	1,889,685	36,600	.....
Year to Jan. 19	3,820,625	173,350	.....

A portion of the tonnage reported this week really belongs in last week's report. The figures from one or two camps were not received in time for this week's issue, but will appear next week.

Missouri Ore Market

JOPLIN, Jan. 19

The highest price reported paid for zinc was $50 per ton, on an assay basis of $46 to $48.50 per ton of 60 per cent. zinc. Average price, all grades, $45.86. The highest price paid for lead was $87.50, medium grades bringing $84 to $86, and an average, all grades, of $83.98 per ton. The corresponding week last year zinc sold at $54 and lead at $76 per ton.

Considering that 9000 tons of zinc ore

are piled up in bins throughout the district, the demand is exceptionally strong, because the ore in the bins is sold and money advanced on most of it. The smelters have thousands of dollars tied up in this ore and cannot move it on account of the inability of the transportation companies to provide enough cars. The week's shipment was reduced through this cause, at some points, and at others rain and mud made impassable roads. No cold weather has visited this district this winter, except a light freeze in the latter part of November, and the output has been large. This week, however, broken gas mains caused a loss of two days at many mines.

Following are the shipments of zinc and lead concentrate from the various camps of the district for the week ending today:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville.	2,608,980	845,860	$96,837
Joplin	2,192,680	228,100	61,108
Galena-Empire	1,127,640	103,090	30,266
Badger	923,100	3,040	22,743
Alba-Neck City	587,020	.....	14,381
Duenweg	356,980	91,260	12,219
Aurora	432,350	.....	8,990
Granby	430,000	72,000	8,800
Carthage	274,240	.....	6,718
Spurgeon	242,540	42,120	6,471
Prosperity	69,590	102,950	5,960
Springfield	.....	62,240	2,614
Sherwood	59,680	27,010	2,536
Lawton	57,670	.....	1,355
Totals	9,362,420	1,577,720	$280,998
Three weeks	31,621,790	4,558,950	$913,848

Zinc value, the week, $214,746; three weeks, 723,321
Lead value, the week, 66,252; three weeks, 190,527

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months; the average for zinc being based on the prices of assay basis ores carrying 60 per cent. zinc:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1906.	Month.	1905.	19
January	52.00	47.38	January	61.80	75.20
February	52.77	47.37	February	57.62	72.88
March	47.40	42.68	March	57.20	73.73
April	42.88	44.63	April	58.00	75.13
May	43.31	40.51	May	58.27	78.40
June	40.75	43.83	June	57.80	80.96
July	43.00	43.25	July	58.00	74.31
August	43.83	43.56	August	58.00	75.36
September	46.75	42.68	September	63.50	79.64
October	47.60	41.55	October	63.88	79.84
November	49.56	44.13	November	68.67	81.98
December	49.00	43.68	December	76.26	81.89
Year	44.88	43.24	Year	62.12	77.40

Chemicals

NEW YORK, Jan. 23

Copper Sulphate—The market remains firm and steady, with a fair demand. Prices are unchanged at $7.25 per 100 lb. for carload or larger quantities, and $7.50 per 100 lb. for smaller slots.

Phosphates—Exports of phosphate rock through the port of Savannah for the month of December are reported by J. M. Lang & Co. as follows: Italy, 597 tons; Holland, 956 tons; Germany, 4427; total, 5980 tons.

Sulphur—Messrs. Emil Fog & Sons report from Messina, Sicily, under date of Jan. 1, that exports and stocks of sulphur in Sicily were as follows, up to Nov. 30, in tons of 1030 kg. each.

	1905.	1906.	Changes.
Exports, Nov.	24,531	18,778	D. 5,753
" 11 mos.	415,547	369,898	D. 45,649
Stocks, Nov. 30	451,355	520,257	I. 68,902

The November exports included 4047 tons to the United States in 1905, and 1717 tons in 1906; a decrease of 2330 tons.

British Chemical Trade — Exports of chemicals from Great Britain for the full year were as follows, in cwt. of 112 lb. each:

	1905.	1906.	Changes.
Bleaching powder	937,000	1,003,537	I. 66,537
Muriate of ammonia	99,269	130,585	I. 31,316
Soda ash	1,491,646	1,901,488	I. 409,842
Bicarbonate of soda	426,481	404,740	D. 21,741
Caustic soda	1,508,965	1,592,455	I. 83,490
Soda crystals	201,129	189,970	D. 11,159
Soda sulphate	742,332	980,099	I. 237,767
Sulphuric acid	85,866	98,029	I. 12,163

Exports of copper sulphate were 55,881 tons in 1905, and 42,982 tons in 1906; a decrease of 12,899 tons last year.

Imports of chemicals and raw materials into Great Britain for the year were, in long tons:

	1905.	1906.	Changes.
Nitrate of potash	9,108	11,166	I. 2,063
Nitrate of soda	104,436	108,486	I. 4,050
Phosphates	420,988	422,970	I. 21,982
Sulphur	20,016	25,033	I. 5,017
Pyrites	696,746	759,324	I. 60,578

Estimating sulphur contents of pyrites at the usual figure, the total imports of sulphur were 299,514 tons in 1905, and 338,763 tons in 1906; an increase of 39,249 tons last year.

Mining Stocks

NEW YORK, Jan. 23

The general tone of the stock markets remains uncertain. Conditions are about the same as last week, and there is no perceptible improvement. The impression is that the period of liquidation is not yet over. Some people had anticipated a boosting of the market in the hope of making room for new securities, but such a movement has not been apparent.

Amalgamated declared the same dividend—2 per cent.—as for the previous quarter. Some people were disappointed, though it is hard to say why, since this company's dividend policy is always a mystery to outsiders.

The mining stocks on the New York curb were more active, though no special excitement has been visible. The Boston market continues active though less excited.

All sorts of rumors of copper consolidations are still heard, but nothing definite or final can be said about the matter.

Boston Jan. 22

The reaction which started a week ago in copper shares continued the greater part of the week. It was accelerated by reports that a hitch had occurred in the pending combination of certain companies and these were the stocks that had the greatest setback. Saturday last saw the lowest prices, and since then there has been some recovery. Speculation has tamed down, and the volume of business is nearing normal. In the meantime another new record has been established, being that of Boston Stock Exchange memberships. One seat sold last week for $38,500, which is the best price they ever brought, and $1000 above the last previous sale. As indicating the interest that mining shares have created it is noted that stock exchanges are being established in various Western centers, and preparations are said to be making to take some of the New York curb stocks on the Stock Exchange there, regardless of their par value.

Wolverine established a new price record by selling up to $200 per share. It is thought that the next dividend will be $10, semi-annually. There was some disappointment felt because the Amalgamated dividend was not increased, and the stock dropped $7 to $111.62½, but it recovered to above $116 today. Copper Range broke $2 to $93.50, but has recovered the loss, and North Butte tumbled $6 to $111.50, recovering to $115. Osceola fell $7.50 to $157, but went back to $166 today. Tamarack fell $14 to $148, recovering to $162. Calumet & Arizona went off $5 to $177, but touched $184 today. Isle Royale, which stiffened $2.25 to $36, went off to $31, recovering to $33.75. Quincy fell $6 to $114, but is back to $121 today. Utah Consolidated slumped $3.50 to $70.25, with recovery to $74. United States Coal and Oil spurted $2.25 to $13.25, reacting slightly. United States Smelting fell $2 to $66, with partial recovery.

Trinity fell from $39 to $34.75, but recovered to $38.87½ today. Lawson is pursuing a vigorous newspaper advertising campaign, which accounts for the popular interest in this stock. Shannon went to above $24, which is its highest record. This company has increased the number of stockholders the past few months, and now has about 2300 owners. Winona advanced from $12.50 to $13.75, and Wyandot has been an active feature, selling up to $3.50. The latter has struck the Winona lode, which brought buying orders. American Zinc rose sharply to $53, reacting to $50.50 tonight, against the close a week back at $45. Calumet, after touching $960, fell to $935, but is back to $950. Greene Consolidated slipped off $2 to $29.50, but recovered $1. Allouez slipped back $6 to $63, recovering one-half the decline, and Centennial fell $3.50 to $38.50, rallying to above $41.

Butte Central has been a curb feature, the common advancing from $7.50 to $8.50 and the preferred from $11.50 to $14. Davis-Daly has been active, settling to $17.12½, with recovery to $18.37½. Superior & Pittsburg rose from $26 to $28.75 on reports of a rich strike at the property, but yielded to $27.50 on profit-taking. Nipissing has been quiet. It has been found necessary to have a transfer agency in this city for this company's stock.

Colorado Springs Jan. 18

The local stock market has been dull and featureless. The most active traders this week were Isabella with 28,000 shares to her credit and Work with 25,500. There seems to be an Ethiopian in the C. K. & N. woodpile as a sale was recorded at 15 on Tuesday, with no bids at over 6½ since, until to-day, when a sale of 5000 was recorded at 6⅞. It has been bolstered up for some time and has seemingly sold as high as 18c. It is generally conceded that this stock is now selling for all it is worth, considering its high capitalization. The balance of the list has held firm, some of the stocks advancing slightly. The predicted after-holiday activity has failed to arrive.

STOCK QUOTATIONS

NEW YORK Jan. 22	
Name of Comp.	Clg.
Alaska Mine	1⅝
Am.Nev.M.&P.Co.	....
Amalgamated	115⅝
Anaconda	279
Balakiala	13¼
British Col. Cop.	9⅝
Buffalo Cobalt	3
Butte & London	....
Butte Coalition	37½
Butte Cop. & Zinc	5⅞
Cobalt Contact	⅛
Colonial Silver	3⅜
Cum. Ely Mining	13
Davis Daily	18¾
Dominion Cop.	6⅝
El Rayo	6½
Foster Cobalt	2⅝
Furnace Creek	2¼
Giroux Mine	9⅞
Gold Hill	5
Greene Gold	2
Greene G. & S	2
Greenw'r & D.Val.	....
Guanajuato	5
Guggen. Exp.	270
Hanapah	....
McKinley Dar.	2⅛
Micmac	6⅜
Mines Co. of Am	2⅜
Mitchell Mining	5½
Mont Sho.C.(New)	12¾
Nev. Utah M. & S.	4¾
Newhouse M. & S.	16¾
Nipissing Mines	13⅜
Old Hundred	4
RichmondEureka	....
Silver Queen	2¾
Stewart	2
Tennessee Copper	51¾
Union Copper	⅞
Utah Apex	7½
West Columbus	....

N. Y. INDUSTRIAL	
Am. Agri. Chem.	24
Am. Smelt. & Ref.	148⅝
Am.Sm. & Ref., pf.	116
Bethlehem Steel	....
Colo. Fuel & Iron	59
Federal M.& S.,pf.	95
Inter. Salt	20
Notional Lead	72
National Lead, pf.	....
Pittsburg Coal	16¼
Republic I. & S.	38
Republic I.& S.,pf.	98⅜
Sloss-Sheffield	73½
Standard Oil	539
Tenn. C. & I.	....
U. S. Red. & Ref.	....
U. S. Steel	47½
U. S. Steel, pf.	105⅝
Va. Car. Chem.	....
Va. I. Coal & Coke	95

ST. LOUIS Jan. 19		
N. of Com.	High.	Low.
Adams	.40	.25
Am. Nettie	.08	.06
Center Cr'k	2.40	2.25
Cent. C. & C.	65.50	63.50
C.C. & C. pd.	80.00	79.00
Cent. Oil	60.00	50.00
Columbia	5.00	4.50
Con. Coal	24.00	22.00
Doe Run	150.00	140.00
Gra. Bimet.	.40	.22
St. Joe	20.00	18.00

BOSTON Jan. 22	
Name of Comp.	Clg.
Adventure	5¼
Allouez	66
Am. Zinc†	50¾
Arcadian	13½
Atlantic	15½
Bingham	33
Boston Con.	30½
Calumet & Ariz.	184
Calumet & Hecla	950
Centennial	41
Con. Mercur	.52
Copper Range	95
Daly-West	19¾
Franklin	25¾
Granby*, New	130
Greene Con	30¼
Isle Royal	33¾
Mass	8¾
Michigan	22
Mohawk*	92
Mont. C. & C.(new)	1⅞
Nevada	18¾
North Butte	114¾
Old Colony	1¾
Old Dominion	57
Osceola*	65¼
Parrot	32¾
Phoenix	1⅛
Quincy†	120
Rhode Island	11¼
Santa Fe	6½
Shannon	24
Tamarack*	160
Tecumseh	....
Trinity	38¾
United Cop., com.	73
U. S. Oil	12¾
U. S. Smg. & Ref.	66
U.S.Sm.& Re.,pd.*	47½
Utah Copper*	74
Victoria	8
Washington	2¼
Winona	13¾
Wolverine	....
Wyandotte	3½

*Ex. Div. †Ex. Rights.

BOSTON CURB	
Ahmeek	110
Ariz. Com	34
Black Mt.	9¾
Cananea Cent.	31
East Butte	16½
Hancock Con.	17½
Keweenaw	14¼
Majestic	4½
Raven	1¾
Shawmut	1¾
Superior	20
Superior & Pitts.	27½
Trey Man	3¾

LONDON Jan. 23	
Name of Com.	Clg.
Dolores	£1 7s 6d
Stratton'sInd.	0 3 3
Camp Bird	1 8 9
Esperanza	2 16 10½
Tomboy	2 0 7½
El Oro	1 5 6
Oroville	1 0 9
Somera	0 5 1½
Utah Apex	1 12 6
Aris.Cop.,pfd.	3 15 0
Ariz.Cop.,def.	3 12 6

Cabled through Hayden, Stone & Co., N. Y.

S. FRANCISCO Jan. 16	
Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.70
Best & Belcher	1.50
Caledonia	.61
Challar	.19
Con. Cal. & Va.	1.10
Crown Point	.30
Exchequer	.65
Gould & Curry	.36
Hale & Norcross	.90
Mexican	1.05
Ophir	2.90
Overman	.23
Potosi	.23
Savage	.95
Sierra Nevada	.68
Union	.51
Utah	.66
Yellow Jacket	1.05
TONOPAH STOCKS	
Golden Anchor	.40
McNamara	.63
Montana-Pitts	.20
North Star	.39
Rescue	.21
GOLDFI'D STOCKS	
Black Ants	.15
Blue Bull	.54
Columbia Mt.	1.37
Comb. Frac.	5.87
Conquerer	.32
Daisy	3.02
Florence	3.75
Frances-Mohawk	.90
Goldfield Con.	9.50
Grandma	.26
Great Bend	1.32
Red Hills	.34
St. Ives	.97
BULLFROG STOCKS	
Amethyst	.61
Bonnie Claire	.35
Mayflower Con.	.67
Montgomery Mt.	.46
Original	.24
MANHAT'N STOCKS	
Gold Wedge	.20
Manhattan Mg.	.19
Pine Nut	.28
Ruby Wonder	.32
Yellow Horse	.11

NEVADA Jan. 28 (Weir Bros. & Co., New York)	
TONOPAH STOCKS	Clg.
Tono'h Mine of N.	18.25
Tonopah Exten.	5.50
Montana Tonop'h	3.90
Belmont	5.37½
Tonopah Midway	2.25
West End Con.	1.80
Jim Butler	1.24
GOLDFI'D STOCKS	
Sandstorm	.75
Kendall	.60
Red Top	4.25
Jumbo	4.25
Goldfield Mining	1.70
Dia'dfield B. B. C.	.59
Atlanta	.89
Mohawk	17.50
Silver Pick	1.47
Laguna	1.64
BULLFROG STOCKS	
Mont. Shoshone C.	12.62½
Tramps Con	1.75
Gold Bar	1.44
Bullfrog Mining	.43
Bullfrog Nat. B.	.56
Homestake Con.	1.35
MANHAT'N STOCKS	
Manhattan Con.	.97
Manhat'n Dexter	.77
Jumping Jack	....
Stray Dog	....
Indian Camp	....

COLO. SPRINGS Jan. 19	
Name of Comp.	Clg.
Acacia	12¼
C. C. Con	5⅝
Dante	....
Doctor Jack Pot	....
Elkton	61¼
El Paso	59¾
Findley	....
Gold Dollar	8
Gold Sovereign	....
Isabella	29
Jennie Sample	7¾
Mary McKinney	62
Pharmacist	7
Portland	1.32½
Vindicator	....
Work	15

New Dividends

Company.	Payable.	Rate.	Amt.
Amalgamated Copper	Feb. 25	$2.00	$3,100,000
Beck Tunnel, Utah	Jan. 20	0.04	40,000
Consolidation Coal	Feb. 1	3.50	358,750
Dominion Coal, pfd	Feb. 1	3.50	105,000
Fairmont Coal	Feb. 1	3.00	360,000
Grand Central, Utah	Jan. 15	0.06	15,000
Homestake, S. Dak.	Jan. 25	0.50	109,200
International Nickel, pfd.	Feb. 1	1.50	133,500
Mexico Con. M. & S	Feb. 25	0.50	120,000
N. Y. & Hond. Rosario	Jan. 19	0.10	15,000
Nipissing Mines	Jan. 20	0.25	300,000
Osceola, Mich.	Jan. 24	6.00	600,000
Tamarack, Mich.	Jan. 24	3.00	300,000
Tennessee C., I. & R. R.	Feb. 1	1.00	225,586
Tennessee C., I. & R. R., pfd	Feb. 1	2.00	4,960
Tonopah of Nevada	Jan. 21	0.35	350,000
United Copper	Jan. 30	1.75	787,500
U. S. Cast Iron Pipe	Mar. 1	1.00	150,000
U. S. Cast Iron Pipe, pfd.	Mar. 1	1.75	262,500
U. S. Smelt., Ref. & Mg.	Apr. 1	0.87½	1,312,500
U. S. Smelt., Ref. & Mg., pfd.	Jan. 15	0.87½	1,312,500
Vindicator Con., Colo.	Jan. 25	0.03	45,000
Yankee Con., Utah	Jan. 21	0.03	15,000

Assessments

Company.	Delinq.	Sale.	Amt.
Bullion, Nev.	Feb. 11	Mar. 8	$0.05
Golden Gate, Cal.	Jan. 7	Feb. 6	0.01
King Solomon, Cal.	Dec. 17	Jan. 24	0.02
Mexican, Nev.	Jan. 10	Jan. 31	0.15
Naildriver, Utah	Dec. 24	Jan. 10	0.05
Nevada Superior	Jan. 21	Feb. 9	0.10
Potosi, Nev.	Jan. 7	Jan. 29	0.10
Red Cloud, Idaho	Dec. 15	Jan. 15	0.001
Scottish Chief	Feb. 6	Feb. 25	0.02
Star Con., Utah	Dec. 20	Jan. 9	0.03
Susannah, Utah	Dec. 21	Jan. 10	0.00½
Vicksburg, Utah	Jan. 9	Jan. 21	0.01
Union Con., Nev.	Feb. 11	Mar. 4	0.10
Wabash, Utah	Jan. 12	Feb. 2	0.05
West'nMinesCo.,Nv.	Dec. 24	Jan. 24	0.02
Yellow Jacket	Dec. 17	Jan. 27	0.15

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1905.	1906.	1905.	1906.
January	60.690	65.288	27.880	30.113
February	61.022	66.108	28.047	30.464
March	58.045	64.597	26.794	29.854
April	56.600	64.765	26.108	29.984
May	57.832	65.976	26.664	30.968
June	58.428	65.394	26.910	30.185
July	58.915	65.105	27.168	30.113
August	60.259	65.949	27.822	30.529
September	61.695	67.927	28.526	31.453
October	62.084	69.522	28.637	32.148
November	63.849	70.813	29.493	32.671
December	64.850	69.060	29.977	32.003
Year	60.352	66.791	27.839	30.868

The New York prices are in cents per fine ounce; the London quotation is in pence per standard ounce, 0.925 fine.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic.		Lake.			
	1905.	1906.	1905.	1906.	1905.	1906.
Jan.	15.008	18.810	15.128	18.419	68.262	78.869
Feb.	15.011	17.869	15.136	18.116	67.963	78.147
March.	15.125	18.361	15.260	18.641	68.174	81.111
April.	14.920	18.375	15.045	18.688	67.017	84.702
May	14.627	18.457	14.820	18.724	64.875	84.887
June	14.673	18.442	14.813	18.719	65.281	83.904
July	14.868	18.190	15.005	18.585	66.887	81.167
Aug.	15.664	18.380	15.725	18.706	69.830	83.864
Sept.	15.965	19.033	15.978	19.328	69.667	87.831
Oct.	16.279	21.208	16.332	21.722	71.406	97.269
Nov.	16.599	21.833	16.758	22.398	74.727	100.270
Dec.	18.328	22.886	18.398	23.350	78.993	105.226
Year.	15.590	19.278	15.699	19.616	69.465	87.282

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling, per long ton of 2240 lb., standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1905.	1906.	Month.	1905.	1906.
Jan.	29.525	36.390	July	31.760	37.275
Feb.	29.262	36.408	August	32.886	40.606
March	29.523	36.662	Sept	32.008	40.515
April	30.525	38.900	Oct	32.481	42.852
May	30.049	43.313	Nov	33.443	42.906
June	30.329	39.260	Dec	35.836	42.750
			Av. year.	31.358	39.819

Prices are in cents per pound.

AVERAGE PRICE OF LEAD, NEW YORK

Month.	1905.	1906.	Month.	1905.	1906.
Jan.	4.562	5.600	July	4.524	5.750
Feb.	4.490	5.464	Aug	4.665	5.750
March	4.470	5.380	Sept.	4.860	5.750
April	4.500	5.404	Oct.	4.850	5.750
May	4.500	5.685	Nov.	5.200	5.750
June	4.500	5.750	Dec.	5.423	5.900
			Av., year.	4.707	5.657

Prices are in cents per pound. The London average for January, 1906, was £16.850 per long ton; February, £16.031; March, £15.922; April, £15.959; May, £16.725; June, £16.813; July, £16.525; August, £17.109; September, £18.266; October, £19.350; November, £19.281; December, £19.609; year, £17.370.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1905.	1906.	1905.	1906.	1905.	1906.
Jan.	5.190	5.487	5.032	5.337	25.062	28.295
Feb.	5.139	5.075	5.982	5.924	24. 594	25.844
Mar.	5.067	5.309	4.917	5.056	23.825	24.563
April	5.817	5.078	5.567	5.931	23.813	25.781
May.	5.434	5.997	5.284	5.846	23.594	27.000
June	5.190	6.096	5.040	5.948	23.875	27.726
July	5.396	6.006	5.247	5.856	23.938	26.800
Aug	5.706	6.027	5.556	5.878	24.675	26.938
Sept.	5.887	6.216	5.787	6.056	26.376	27.563
Oct.	6.067	6.222	5.934	6.070	28.236	28.075
Nov.	5.145	6.375	5.984	6.225	28.500	27.781
Dec.	5.522	6.593	6.374	6.443	28.719	27.938
Year.	5.822	5.196	5.730	6.048	26.433	27.020

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2240 lb.) good ordinary brands.